The

Electrical Review

VOL. CVII. AUGUST 22, 1930. No. 2752.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman and Joint Managing Director: G. H. ALABASTER COMPANION I.E.E.

Technical Editor: C. O. BRETTELLE, M.I.E.E.

Joint Managing Director: E. A. GATEHOUSE M.I.E.E., A.M.Inst.C.E.

Commercial Editor: A. H. BRIDGE

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 8871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
"Ich Dien"	285
Two 1931 Events	286
The Drumm Battery	286
S.S. "Empress of Japan," by W. E. Swale *(illus.)*	287
High-resistance Cable Faults, by T. G. Partridge *(illus.)*	289
The Drumm Battery—Is it a Revolution? by R. N. Tweedy	290
Electricity Supply Progress—I *(illus.)*	293
Electricity for the Home *(illus.)*	295
The Road Traffic Act, by J. W. Parker	296
The Electric Organ, by G. B. Fuller *(illus.)*	297
Business and Industrial Notes	299
Lighting and Power Notes	302
Tramway and Railway Notes	305
Telegraph and Telephone Notes	305
Radio Notes	305
Contract Information	306
Forthcoming Events	307
Notes	307
Our Personal Column	309
Financial Section—	
New Companies Registered	310
Financial Section—*contd.*	
Official Returns of Electrical Companies	310
City Notes	311
Stocks and Shares	311
Our Foreign Electrical Trade	313
Commonsense Correspondence, by A. Hobarte	314
The Pykara Hydro-electric Scheme	314
High-power Rectifiers *(illus.)*	315
Factory Inspectorate Report	316
An Automatic Hydro-electric Installation *(illus.)*	317
Electrical Rail-track Welding *(illus.)*	318
New Electrical Devices, Fittings, and Plant *(illus.)*	319
The History of the G.E.C.	320
Reviews	320
Correspondence—	
Interference with Radio Reception	322
Rural Electrification	322
The Design of Bus-bars and Connections	322
Electricity v. Gas for Heating	322
A Meter Problem	322
Criticism from Overseas	323
Published Specifications	323
Trade Mark Applications	323
New Work for Contractors	324

"Ich Dien."

SO much of platitude concerning salesmanship is finding persistent utterance in these days that business-men are becoming bored by parrot-cries. They would welcome the rise of some Apostle of Originality who, from a wealth of practical experience and imagination in discreet combination, would tell the industrial world something new which would guide it into the way of all truth regarding the subject.

Generalisations are little more than valueless to anybody who is seriously in search of guidance—specialised industries require specialised treatment just as special markets do.

Long before the demand arose for efficiency of production and improved general, financial, and industrial organisation, we were telling ourselves as traders that it was useless producing, financing, and organising up to top notch, unless we went out and found markets by studying the people of the world, and so secured continuous demand. Such self-criticism was once the regular and recognised thing. And here we are still listening to the truism that selling is the very foundation of industry, while the voice of manufacturing authority echoes around our ears with the conviction that it is reputation for excellence of product that is the very foundation upon which demand is built up. Of course, it is all very true; it is useless to produce unless you or somebody else has made arrangements to sell. But of what avail is it to join in the common parrot-cry and chatter again and again that all our ideas of efficient salesmanship are wrong? Where is the wisdom of imagining that we ought to think in the same way of selling ability as a thing for uniform application to diversified classes of trade?

Can we produce essential methods for developing the sale of gas and electricity and present them for similar application in selling boots or boilers, drapery or dynamos? Sir Francis Goodenough has been talking to the Drapers at their Summer School at Cambridge on this theme of salesmanship, the various aspects of which have engaged so much of his thought of late, but it

seemed obvious to us from *The Times* report of his speech that his suggestions were to some extent based upon his experience in the service given in connection with the noxious and poisonous yet nevertheless useful commodity for which he has achieved fame. We really feel that when he speaks of gas he comes into closer relationship with the electrical industry than when he discourses to purveyors of silk stockings and hosiery, for in such a matter as Service, electricity and gas supply have much in common.

We confess to feeling a trifle mischievous when we read that in his branch of public service he has found that in over twenty years' experience in dealing with customers of all ranks, now numbering well over one million, "complaints were very rarely entirely unfounded." Now, deplorable as it may seem, the great majority of users of electricity are still users of gas as well for some purpose or other, and these will agree that there is good ground for the complaints that they make about gas. What we wonder is whether as double consumers they have the same feeling with regard to electricity and are satisfied with the handling of their complaints respecting it. Fairness requires that we should not deprive Sir Francis of the credit that is his due for the Service that he gives to the complaining gas consumer. He even goes in search of him before he has lodged any complaint at all, and helps lavishly, promptly, and along well-organised lines, centrally as well as locally, in his efforts to please. What we should all try to ensure is that electricity authorities, whether companies or municipalities, also their officials and staffs, as well as the contractors acting under, or in co-operation with, them should show the same eagerness. Service given by a municipality is service given by the people for the people; that rendered by a company is given by private capital purely for the sake of doing business which shall make a profitable private return.

In our efforts to give electrical service we shall do well always, at the first approach, to regard the complaint as well founded. Great stores as well as great electrical and gas undertakings have special departments for handling this branch of business management. They want the purchaser to be satisfied so that he shall come again. Service costs money, of course, but there is a return—it is not rendered from philanthropic motives. The necessity for it is more pressing in the case of electrical installations in our homes because of their technical aspect, and wisdom dictates its embodiment in all our coming schemes for hire-purchase, assisted wiring, and so forth.

Reverting to the subject of selling in connection with trade in manufactured products both at home and overseas, here we have a class of activity which calls for qualifications quite different from those that are essential in selling electrical energy or in convincing the average householder of the merits of some piece of domestic apparatus. Experience on the road at home is more valuable than some courses of college training in salesmanship, indeed few overseas men succeed if they have not first had the rough and tumble among men at home. But apart from this elementary consideration it seems often to be overlooked that the essentials for efficient overseas travelling must vary both with the class of product for sale, and with the class and value of the contract—£100 worth of lamps or plant running into millions sterling. The potential buyers range from princes almost down to peasants. Cannot we conjure up what that means? We believe that in the individual experiences of our electrical manufacturing concerns on their commercial side there lies a vast amount of information of practical value, but this is not pooled as is other specialised information. There is always a limitation to co-operation and must be when firms have bought experience, trained exceptional men, and built up special connections. They may co-operate up to a point in research matters, but even these arrangements sometimes break down. Some of our electrical and engineering companies have reason to be proud of their overseas achievements, and, though always open to learn something more, they find little to help them in general salesmanship talks, but they could, if they would, contribute useful information for the benefit of concerns which have never ventured far enough on their own account. A symposium of the experiences and views of such concerns or their representatives would form very interesting reading, but can we expect them to contribute what are their own trade secrets? They may speak regarding general principles, but can we expect them to go much further than that? They would emphasise the giving of "Service." But building up overseas trade is still largely a matter of individual enterprise and outlay.

Two 1931 Events.

Though nearly six months distant, we desire to lay stress upon two important trade events arranged for the early months of 1931. First, we appeal to our overseas readers to make their plans for visiting the British Industries Fair in the last weeks of February at Birmingham and Olympia. Perhaps with a little more forethought a larger number of buyers may find it possible to visit this country at that time to inspect the very fine collection of electrical exhibits that is again assured. If not, they should at any rate be able to examine early and fully into their electrical needs and instruct their Home representatives in good time.

The second event calling for prominent and early attention is the great British Empire Exhibition that is to take place at Buenos Aires in March and April. It is satisfactory to note that British manufacturers are taking large space (see our "Business Notices" to-day), indicating their appreciation of the value of this occasion for organised effort in seeking trade in a most substantial and promising market. South America is well worth a visit from British electrical traders.

The Drumm Battery.

Those who read the daily Press for sensations rather than for news of events will have been disappointed by the pronouncement of the Minister of Industry and Commerce of the Irish Free State reported in our issue of August 8th. This pronouncement lends no countenance to the wild claims that have been made for the Drumm battery—claims which, of course, did not emanate from any responsible quarter.

On the other hand, those with any pretensions to a knowledge of scientific and commercial limitations are apt to be prejudiced against an invention that seems to promise to transcend the bounds of physical possibility. They will welcome the sober statement by the Ministry on the tests conducted on the Irish railways, which bring anticipations down to the realistic plane.

In this issue we publish an article by Mr. Robert N. Tweedy, who analyses the claims made for the battery from the patent specification as well as from the results of the recent tests. Our contributor points out that the conditions found on the Irish railways do not obtain everywhere, but he evidently expects the success of the battery to have a more than local significance.

The most important feature of the battery is, in our view, the very high charging rate possible, which should enable it to be used for haulage of light trains over long distances by the provision of a third rail at intervals for recharging the cells. A reasonably long life for the battery under these conditions awaits the proof that only time can give.

In regard to the effect of the advent of the Drumm battery on the future of the lead-acid battery, from the information at present available it would appear that the two types may well be complementary in their practical applications. A lead-battery has not been evolved to meet the conditions for which the Drumm battery is designed, and therefore could hardly be regarded as a rival. In many of the other fields in which secondary accumulators find employment, the particular advantages of the new battery would not have the same value, and the comparison would therefore turn on grounds of capital cost, maintenance, and efficiency with relatively steady loads and stationary operation.

S.S. "Empress of Japan."

A description of the latest Canadian Pacific liner, with special reference to her electrical equipment.

By W. E. SWALE, A.M.Inst.C.E., A.M.I.E.E.

(*Concluded from page 249.*)

The use of slate for switchboards, distribution boards, and control panels on the ship has been entirely avoided, its place being taken throughout by "Ebony Sindanyo" with enamel finish, manufactured by Turners Asbestos Cement, Ltd. "Sindanyo" is claimed to be some 70 per cent. to 80 per cent. lighter than slate, hence 1½-in. panels are used in place of 2-in. slate panels, and it is infinitely more resilient. This Company is also the sole distributor of "Siluminite," the material of which all the open-type fuses, amounting to several hundred, on the ship are made.

Such factors as a high ambient air temperature, the presence of sea-water and oil and steam pipes, and the continual straining of the ship's members, combine to make the conditions for electric cables particularly arduous. Very special care was taken in the choice of material, and in the methods of fixing cable runs. For example, the 1,800-A ring-mains are of "Maranex"-type cable, which is paper-insulated, lead-alloy sheathed, armoured and braided. No joints are made in any cable, wire, or branch conductor. The total length of cables installed amounts to something like 300 miles, and the whole of this was supplied by Callender's Cable & Construction Co., Ltd., at a cost of roughly £20,000. The wiring and installation were carried out entirely by the shipbuilders.

All the important passengers' and officers' quarters are equipped with local steam or electric radiators, and oscillating electric fans, no less than 250 of the latter being provided. The main ventilating system comprises 38 "Thermotank" fans, 45 exhaust fans, and 21 supply fans, for which Laurence Scott & Electromotors, Ltd., have supplied 84 motors, and W. H. Allen the remaining 20. In cold weather all living accommodation is supplied with fresh air at a maximum temperature of 70 deg. F. by a series of 38 steam-heated "Thermotanks," located mainly on the boat deck around the three funnels, fig. 8. In extremely hot weather the heater on the issue rooms air circuits can be brine cooled. Air is distributed to the various spaces by the "Thermotank Punkah Louvre" system, using revolving-ball louvres in the first- and second-class public rooms and entrances, and fixed-ball louvres in other rooms. All the ventilation fans and "Thermotanks" were made by Thermotank, Ltd., who were responsible for the complete scheme of ventilation. A novel and interesting feature of the ventilating equipment is the master control panel, situated forward of the main switchboards, from which everyone of the 104 motors can be governed. Each fan motor is governed by a 3-speed contactor controller, and numbers of these are grouped together, *e.g.*, all the "Thermotank" fan controls are fixed in a special deck

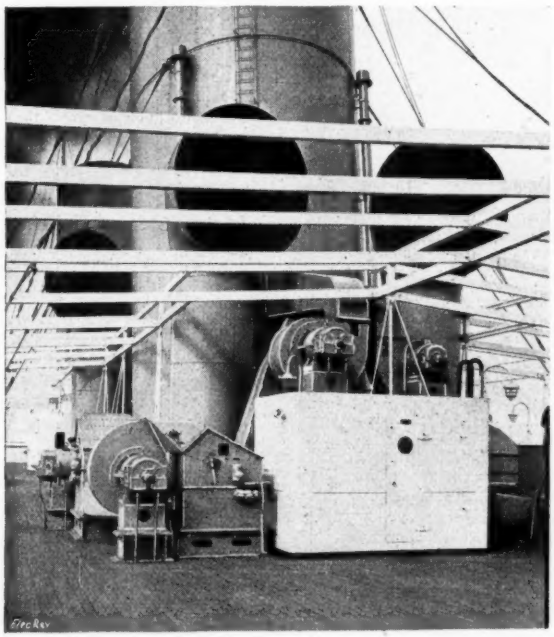


Fig. 8.—"Thermotanks" on Games Deck.

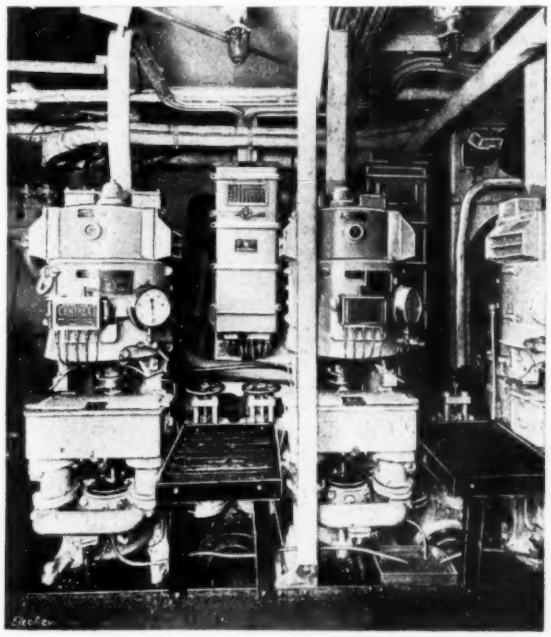


Fig. 9.—Forced-lubrication Pumps.

house underneath the navigating bridge. Each set of contactors can be actuated either from the control board or by a local master controller fixed near the motor.

The electro-hydraulic steering gear, manufactured by Brown Bros. & Co., Ltd., fig. 10 (taken in the makers' works), is of particular interest. The rudder is operated

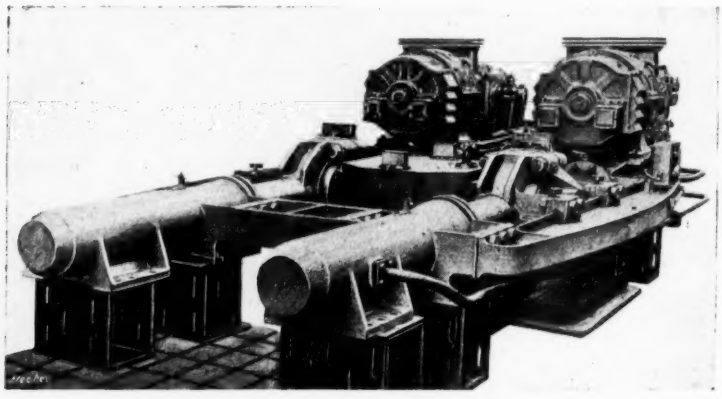


Fig. 10.—Electro-hydraulic Steering Gear.

by four hydraulic cylinders, arranged in pairs on either side of the rudder stock. A " Rapson " slide arrangement allows the straight-line motion of the rams to be transmitted to the angularly moving tiller. Power is supplied by two constant-speed non-reversing Laurence Scott motors, each driving a Williams-Janney variable-delivery pump. Each unit is capable of performing all normal steering, whilst for quick steering, when docking or manœuvring, both can be used together. When steaming full-speed ahead the rudder can be moved from " hard over " in one direction to " hard over " in the other in a period not exceeding 30 seconds. The control gear for the 100-h.p. steering motors, supplied by Brookhirst Switchgear Co., Ltd., deserves mention. A multiple-lever starter, with ratchet handle, the main contactors, and signal devices are located at either end of the main feeder switchboard, fig. 6, and are mounted on enamelled " Ebony Sindanyo " to match the rest of the board.

Seven sets of capstan drives, forward and aft, have been supplied by Laurence Scott & Electromotors, Ltd., working on their " reducer " system, which has been specially designed for ship's work. Each motor is fed from a variable-voltage motor-generator, thus obviating the need for contactor control gear and ensuring even speed variation over a wide range. The 105-h.p. anchor windlass motors, for example, have a range from 280 to 1,000 r.p.m. The cargo is handled by twelve sets of 28-h.p. Laurence Scott winches, each designed for a maximum lift of 3 tons at 150 ft. per min., with a light-hook speed of 450 ft. per min. Twelve winch motors of 15 h.p. each hoist the boats up into the Welin-MacLachlan gravity davits, the lowering being effected by gravity. The Laurence Scott motors are controlled by Allen West drum-type controllers, each of which embodies a single-pole contactor and an overload relay, with resistances mounted inside the water-tight welded-steel case.

The greater part of the cooking equipment, installed in five separate galleys, was supplied by Henry Wilson & Co., Ltd. Fig. 11 shows a portion of the first- and second-class galley, in which two " Island "-type electric ranges are fitted, each 12 ft. long by 6 ft. 6 in. wide, and each having eight ovens and sixteen hot-plates, with a total loading of 161.3 kW. The elements of these ranges consist of " Brightray " spiral resistance wires mounted on " Fireite " formers. Special cast-iron plates, covering the hot-plate elements, are heated by radiation to a cherry-red temperature. The illustration shows clearly the safe and neat arrangement of cables and control switch-fuse panels. The fuses in the kitchens, and in most of the other open-fronted distribution boards, are of Whipp and Bourne manufacture, with " Siluminite " fuse handles. The bakery is electrically equipped throughout, and the equipment includes a dough-mixer and two Wilson's double-tier electric "Peel" ovens rated at 24 kW each. The other electric cooking equipment includes fish fryers, grills, salamanders and stock-pots. Electrically-driven machinery is also used extensively for food preparation before cooking, and for dish washing and silver burnishing.

In briefly passing over the smaller auxiliary equipment, fig. 9 is of interest as it shows not only two Drysdale forced-lubrication pumps, with Laurence Scott motors and Brookhirst starting panels, but it illustrates lighting fittings and cable work, and shows the extreme economy of space that had to be practised in laying out the engine room. Herbert Morris & Co., Ltd., supplied four jib cranes for the ship, the runways of which can be temporarily extended outboard from the ship's holds, for hoisting goods from tenders. The two passenger elevators and four other lifts were supplied by Smith, Major & Stevens, Ltd. " Chalmit "-pattern fittings, each with a high-power gasfilled lamp, illuminate the life-boats during the process of launching, and these are supplemented by two B.T.-H. floodlight projectors, fitted on either side of the bridge. Thirty-six Chalmers & Mitchell cargo clusters, each with five lamps, and a number of 1,000-c.p. portable lanterns illuminate the cargo holds and passengers' gangways. The Sperry Gyroscope Co., Ltd., supplied an 18-in. high-intensity searchlight projector, mounted on a platform on the foremast, as well as the usual Sperry gyroscopic compass. Siemens Bros. & Co., Ltd., supplied their standard " Look out " indicator and navigation lights indicator, and Alfred Graham & Co., Ltd., furnished side tube loud-speaking telephones and a very complete cabin

Fig. 11.—Electric Cooking Ranges in First-class Galley.

'phone intercommunication system, ranging from 2-line to 14-line automatic instruments. A fire-alarm system by the General Electric Co., Ltd., provides for automatic operation by thermostat and for manual operation, and has a telephone connection so that messages can be sent to the bridge, on plugging in a portable telephone. The same Company supplied the luminous indicator system by which a steward or stewardess can be summoned from every cabin.

The very complete 50-page "Specification of Electrical Installation" and the shorter "Specification for Dynamos, Motors, and Control Gear," are evidence of the great care that has been taken to ensure adequate design and high-class workmanship.

In conclusion, the writer wishes to express his sincere thanks to the Engineering Department of Canadian Pacific Steamships, Limited, and especially to Mr. A. Henderson, superintendent electrical engineer of the Company, for the assistance given in the preparation of this description, and to all the manufacturers who have contributed towards this article by supplying information and photographs.

High-resistance Cable Faults.

A Suggested Simple Method of Location by Routine Testing on Live Low-voltage Networks.

By T. G. PARTRIDGE, A.M.I.E.E.

THE present decade is witnessing a very great expansion of 3-phase, four-wire, 400/230-volt networks by electricity supply undertakings in Britain. The capital outlay on new cables will run into a very large sum. Mains engineers are closely supervising their initial laying and jointing, and testing every new section very carefully before putting it into operation.

In the great majority of cases, once new sections are made alive (and consumers connected) they remain alive for good. It therefore seems to be an urgent problem to try and evolve a simple method of routine testing for insulation on the various sections of mains at regular intervals to detect any deterioration and to forestall so far as is possible failures in years to come. All testing should be carried out without interrupting the supply of energy to any consumer.

The assumption that actuaries are expecting the average "life" of cables of low-voltage networks to be thirty years lays a grave responsibility on mains engineers not to fall short of that figure. In some favourable localities where cables are well laid and jointed, and where the ground in their vicinity is not disturbed, forty years of useful life may be achieved.

Fig. 1.—Distributor Section with Four Service Tees.

But in cities, roadways and footways are frequently being opened, altered, and repaired. Telephone, gas, and water mains must be maintained, extended, or renewed. Old buildings are being pulled down, deep excavations are being made for the new buildings, and so on. We cannot, therefore, expect anything but a good deal of disturbance during the next thirty years around cables laid now.

In order to feel the pulse, as it were, of live a.c. networks the author suggests that the continuity of the lead sheathing should be deliberately broken, or bonded, at will by the provision of simple "muffle" joints and links, respectively, at certain selected points. The most convenient position will probably be found to be at network boxes (or pillars). Fig. 1 shows a section of a distributor with four service branches lying between network link boxes at A and B, provided with a "muffle" joint and link on the sheathing (dotted) at each end.

To obtain an indication of the insulation resistance to earth of section A B, the sheathing links would be opened and a milliamperemeter (range 0—5) placed across the link contacts at A. If, on the one hand, no deflection of the needle were observed, all would be well and good. If, on the other hand, a deflection representing, say, 2 milliamperes were obtained the matter would be reported to the mains engineer by the routine tester (usually a leading network box hand). The engineer would then proceed to locate the high-resistance fault in section A B. Testing at end A with the sheathing links open at each end for a few minutes with a "Megger" earth tester would suffice to ascertain the actual earth resistances of the three paths of leakage to earth, *viz.*:—

(*a*) The neutral conductor of the 4-core cable (available at end A by lifting the cover of the network link box).

(*b*) The lead sheath (and armouring) of the distribution and service cables between the "muffles" at A and B.

(*c*) The sheathing of the general network (when connected through the milliamperemeter to (*b*), giving a reading of 2 milliamperes).

Probably the earth resistance of (*b*) would generally be found to be much greater than either that of (*a*) or (*c*); for example:—

Let the earth resistance of (*a*)	=	0.25 ohm.
,, ,, ,, ,, (*b*)	=	0.5 ,,
,, ,, ,, ,, (*c*)	=	0.25 ,,
Leakage current by path (*c*) (as per milliamperemeter)		0.002 ampere
Therefore assume leakage current by path (*a*)	=	0.002 ,,
Therefore assume leakage current by path (*b*)	=	0.001 ,,
Approximate total leakage		0.005 ampere

Voltage of live conductors = 230 to earth.

Therefore approximate insulation resistance to earth of section A B = 230/0.005 = (say) 46,000 ohms.

Ordinary inspection of service joints and cables (when not buried) not affording any clue, the sheathing of the cable (say, 1 in. wide) would be removed near one of the middle service joints. If leakage still persisted when retesting at end A, the sheathing would be divided again, and so on, until the fault was located either in a service lead or short length of main. In the latter case it could be easily cut out and a new short length laid and jointed up without interrupting the supply. In the former case the defective service would be " off " for a short time during repairs, and by proper arrangements beforehand that time could be reduced to a couple of hours or so. The places where the lead sheathing had been stripped off cable could be made good easily and cheaply by sleeving. It is assumed that the four house installations depicted in the example, whether wired in conduit or metal-sheathing system, would be efficiently bonded and earthed independently. If one of the installations was not earthed independently, but the conduit or metal sheathings was found to be bonded to the supply service cable sheathing, that bond should be removed *before* tests are made at A.

If the fault is located on a service cable, before it is cut out the supply service fuses should be removed to confirm that the fault is actually on the service and not communicated from a fault on an internal house installation by any accidental path to the service cable sheathing.

It would also be possible with the " muffle " system described to keep, in addition to network insulation records, regular records of sheathing currents at all points of the network. For instance (fig. 1) by opening the sheath link at A and placing an ammeter across the terminals, then closing the sheath link at A and opening that at B, and so on, the mains engineer would be able to note anything abnormal about any reading, and he would thus be given an opportunity of investigating the reason and putting matters right.

Live house installations could be tested for overall insulation resistance to earth in a similar manner to the foregoing by measuring the milliamperages between (*a*) the bonded conduit (or metal sheathing) and (*b*) the neutral conductor and obtaining the actual earth resistances of (*a*) and (*b*).

Perhaps similar methods could be usefully applied to " feel the pulse " of high-voltage cables when alive, providing that suitable " muffle " joints and links on the sheathing were placed at inspection chambers at regular intervals along the cable route, and a super-sensitive large-scale milliamperemeter manufactured for the purpose were employed. One would rely in this case on obtaining (as one would expect) an exceptionally good earth at the station end. The cable could be tested section by section for approximate insulation resistance to earth.

In conclusion, the author hopes his suggestions will prove to be of general interest, and he invites frank criticism of his proposals.

Should any mains engineers have an opportunity of carrying out practical tests on the above lines on selected sections of their own a.c. low-voltage networks in the near future and communicate the actual results to the author, he would be very pleased to acknowledge such communications and embody the information so revealed in a future paper on the subject.

The Drumm Battery— Is it a Revolution?

A technical commentary on the patent specification, claims made, and the results of road trials now being made, indicating in which respect the new battery differs from existing types and its possible effects on railway traction in the Irish Free State.

By ROBERT N. TWEEDY.

An immense amount of interest and curiosity has been evinced in Great Britain and the Irish Free State in the " mystery battery " which is now in course of development by Prof. James Drumm, M.Sc. While it was in its first laboratory stages, perhaps two years ago, some silly, if enthusiastic, student at University College, Dublin, started the sillier " stunt racket " which the daily Press all over the world has been trying ever since to feed, with very inadequate material. It was enough, of course, for the Press that the invention was electrical. That meant mystery and marvels.

What always happens after the lay Press has handled a technical matter for some time is that the undiscriminating and forgetful public attributes all the wild statements—rendered even wilder and woollier by its own brain processes—to the inventor, or to the Board, or to the Government, or to whomever was concerned with the business in the beginning. The public makes a virtue of credulity, and considers contradiction, or correction, by an expert to be an affront.

The public would hate to think that the only result of a personal interview with the shy and excessively modest inventor of the new battery would be the statement that certain electro-chemical researches had reached a stage at which it was possible to say that the long-continued laboratory experiments were being confirmed and extended on a larger scale. Prof. Drumm will commit himself to nothing more than the hope that work which is still in the experimental stage may prove eventually to be of some value to mankind, in particular to the citizens of the Irish Free State. Prof. Drumm is essentially a research chemist. The success of his present research would gratify his professional pride, but it would not affect greatly his outlook upon life through the window of his laboratory.

The glowing claims which have been made for the battery never originated with Prof. Drumm himself, but created in him a great deal of indignation and annoyance. This brilliant, hard-working young man, who some years ago had devised the only practicable method of preserving green peas in an enjoyable form, and had

produced the pleasantest and most effective shaving soap the author has ever used, was unable to sustain the cost of large-scale experimental work on the new battery. Both Mr. McGilligan, Minister for Industry and Commerce, and Dr. McLaughlin, managing director of the Electricity Supply Board, are contemporaries of Prof. Drumm and graduates of the same university. Both are interested above everything in the improvement of the country through the medium of electricity, and it is to be supposed that they were approached with regard to financing further research. How it was done is matter for surmise, but the outcome was a grant of £5,000 by the Free State Parliament. This was by no means a gift, because the State now holds a large share of the future prospects. A gamble, if one likes to look at it in that way, or a very moderate grant in aid of research in the national interests.

While the inventor himself has said nothing at all about his battery, the Government has said as little as possible, and then only to get the vote for the £5,000, or in an endeavour to curb the enthusiasm of the public. In fact, the first official statement covering the claims made for the battery was issued by the Ministry for Industry and Commerce through the Press on August 2nd.* Before examining that statement let us see what the complete specification filed at the Industrial and Commercial Property Registration Office at 45, Merrion Sq., Dublin, claims.

The invention relates to batteries of the type employing an alkaline electrolyte, usually a solution of hydrogen-hydroxide. Hitherto, for such batteries nickelic-oxide has been employed as the active positive material, and the result has been to produce a battery of which the internal resistance is high; in order to reduce the resistance, it has been necessary to increase largely the plate area. That remedy has been found impracticable with nickelic-oxide, as one grave defect of that active material is its relatively large alteration in volume during the working cycle; it requires, on that account, elaborate and massive positive plates.

The object of the Drumm invention is to overcome the above defects by providing a positive plate of lighter weight and smaller bulk, giving larger energy capacity per unit of weight, or, alternatively, a positive plate of the usual weight and bulk having a lower internal resistance for a given energy capacity per unit of weight, or else some desirable compromise between those alternatives. The invention consists in an alkaline storage battery in which silver, or a silver compound, is employed as the positive active material. One convenient method is to use silver-oxide, or finely divided silver.

A convenient method of producing the silver depolariser is to precipitate a 50 per cent. boiling solution of silver-nitrate with a 20 per cent. solution of caustic soda until the resulting liquor shows a distinctly alkaline reaction with litmus. The precipitated hydrated oxide of silver is collected in a vacuum filter, and washed with a hot spray of 5 per cent. caustic-soda solution until the filtrate liquor comes through the filter free from nitrates. The hydrated silver is then mixed with one-half to one-third its weight of flaked graphite, and the mixture is pressed with flat cakes, or slabs, which are forced into perforated nickelled steel pockets, which are assembled in the form of plates and firmly clamped in a nickelled-steel frame.

Such a silver anode undergoes in use the following changes in each cycle:—on charging, silver oxide (Ag_2O) is formed first, and then is quantitatively oxidised to silver peroxide (Ag_2O_2). On discharge, the peroxide is reduced first to the lower oxide, which, in the final stage of discharge, is reduced to metallic silver. Both oxides are completely insoluble in an electrolyte consisting of from 25 to 30 per cent. caustic potash solution. This may be varied by mixing a certain proportion of ceric oxide (CeO_2) with metallic silver, or the silver oxide may be mixed with nickelic oxide to form a positive plate of any desired capacity.

The cathode may be of the usual cadmium-iron type, which, with the silver anode, furnishes a secondary cell having, when fully charged, an e.m.f. of 1.5 volt, dropping to about 1.15 volt during the second phase of discharge. If the silver anode be used with a negative plate of zinc, the voltages are 1.86 and 1.45, respectively, so that combination is preferred.

This invention permits very rapid rates of charge and discharge, on account of the very low internal resistance of the battery, while the energy capacity is high per unit of weight.

The container can be composed of rustless or nickelled steel, or of " Monel " metal.

The specific claims of the inventor are as follows:—

An alkaline storage battery or accumulator, in which:

(1) Silver, or a silver compound, is employed as the positive active material.
(2) Finely divided silver, or silver oxide, is so used.
(3) Flaked graphite is mixed with the finely divided silver, or silver oxide.
(4) Nickelic oxide is mixed with the silver, or silver oxide.
(5) Ceric oxide is mixed with the silver, or silver oxide.
(6) The positive plate is associated with a zinc negative.
(7) The positive plate is associated with a cadmium-iron negative.
(8) The container is made of rustless, or nickel-plated, steel.
(9) The container is made of " Monel " metal.

There are two further and general claims for improved positive plates for alkaline storage batteries and improved alkaline storage batteries, both " substantially as herein described."

When the Edison alkaline nickel-steel battery was introduced there was a feeling generally current amongst electrical engineers that the acid-lead battery would be superseded if the claims made for the new battery were realised in practice over a sufficient period of time. That was a good many years ago, and the acid-lead battery has not been forced into the background up to the present. It is common knowledge that the alkaline battery has not yet shown such superiority over the other as to make it universally acceptable, and it does not seem probable that this situation can be altered materially so long as the alkaline nickel-steel battery is the only rival of the acid-lead battery.

Nevertheless the lead battery makers, who have very little more rope to slack off in case the tide rises against them, must have felt uneasy whenever they heard rumours of another alkaline battery coming over the horizon. Scepticism probably overcame fear, and the apparent fate of the Almeida battery justified that attitude for the time being. No doubt the Almeida specification sounded as cheerful as the Edison specification, and the mere filing of another cheerful specification by a young Irishman was not likely to alter the mind of the battery makers until something rather more substantial turned up.

How much further does the pronouncement of August 2nd carry us?

First, it should be noted that the Ministry was forced to make it at such an early stage of the extra-laboratory trials that the full number of cells had not yet been made. Secondly, the previous record of the Ministry gives ground for the belief that claims will not be made in excess of probability.

The road tests are being carried out over infrequently-used sections of the Great Southern Railway's lines near Dublin, with a specially constructed coach equipped with two 110-volt d.c. motors rated at 30 h.p. each continuously, but capable of 100 per cent. overload for ten minutes and 200 per cent. momentarily. Speeds of from 45 to 50 m.p.h. have been reached with this equipment, presumably on the level.

The ministerial statement confirms the chief claims in the patent specification. That is to say, the battery is a low-resistance one of robust construction; it has 50

* See Elec. Rev. Aug. 8th, 1930, p. 227.

per cent. higher voltage than any other alkaline battery; and it can be charged and discharged at much higher rates than any other alkaline battery. The statement amplifies those claims as a result of the experience already gained, for we are told that the watt-hour efficiency under practical conditions of operation is 75 per cent.; the construction of the battery is simpler; therefore it should be considerably less expensive to manufacture than any other alkaline battery; it can be charged in as short a period as 8 minutes; it is capable of heavy discharge without appreciable voltage drop; it is not damaged by vibration; and it is superior to any other alkaline battery with respect to retention of charge.

The statement also contains this clause, which may be taken, although it may not be intended, as an indication that the battery is not universal in its application:—"The Drumm battery is suitable for all types of service requiring (*a*) rapid input and output of energy; (*b*) robust construction; (*c*) freedom from fumes and gassing; and these characteristics render it particularly suitable for traction."

So far the comparison has been between the new alkaline battery and the alkaline batteries already on the market, but the only point at which the lead battery would have been able to score was the voltage per cell.

Obviously at this stage nothing very convincing can be said about life. The Minister says:—"While it is not yet possible to state definitely the length of life of the battery the life tests are proceeding. The evidence already accumulated indicates that it will have a very long life."

On the foregoing evidence, taken at its face value, for we are not entitled at present to do anything else, what should be our frame of mind towards the Drumm battery?

It is a heavy-service traction battery, so we must not go beyond our references in trying to form a very tentative judgment. It has an energy efficiency, as a traction battery undergoing amazingly high charge and discharge rates, of 75 per cent. (remember the Minister's phrase—75 per cent. under practical conditions of operation). No lead battery maker could justify a claim to that efficiency, and no other alkaline battery could be entered for the competition, because of its inherent limitations.

All other desiderata being equal, the alkaline battery must be better able to resist the shocks of movement than the lead battery. In order to enter the traction field at all the lead battery makers have had to sacrifice efficiency to the more urgent need for robustness; even so, it is not likely that the Drumm battery will have to have more than two to three years' life to equal the average performance of the lead traction battery.

The entire absence of corrosive gases and fumes is a considerable advantage gained by the Drumm battery over the acid battery, as those who have had to maintain electric vehicles will be the first to acknowledge, but there is nothing as yet to show whether the Drumm battery is free from the serious disadvantage of rapid deterioration of the electrolyte which has to be endured by owners of other alkaline batteries.

Taking the patent specification, but not the official statement, which does not touch the point, we must presume that the positive plates of the Drumm battery give a larger capacity per unit of weight than has been obtained hitherto in alkaline batteries; and that, of course, is a cardinal point in a traction battery. That brings us to the most important feature of all—the phenomenally high charging rate. Taken by itself, the fact that the complete charge can be replaced in eight minutes means that the outstanding (one might say with truth the insuperable) obstacle to battery traction is reduced to very moderate proportions. A lead battery designed to give the high discharge rates and length of run required in railway service without changing on the way would be an utterly uneconomical proposition, but a battery which can be charged, say, four times on a 200-mile run in an aggregate time of less than one hour, or can be charged during the ordinary standing time at each end of a shuttle run of, say, ten miles, brings battery traction right into the field of practical politics.

From the moment that this rapid charging claim was vouched officially the cogent objection has been urged that it never will be practicable to utilise this remarkable feature in the field which has been chosen deliberately for the Drumm battery. Consider, it is said, a 1,000-h.p. locomotive drawing a train at 50 m.p.h. on a run of 200 miles. How is it possible to deal at four points on the route with power of the order of 8,000 kW? Modern service demands locomotive powers greatly in excess of 1,000 h.p., but the present requirements in the Irish Free State probably do not go beyond, or even so far as, that figure.

It seems to the author that such queries, although natural, are beside the point. Whenever an important discovery has been made modifications in existing practice always have followed in order to utilise the discovery. Who would have supposed that the Bushmills elevated third-rail light railway would evolve in a matter of 35 years to the underground networks of London and New York, or to 4,000-h.p. main line locomotives of the Paris-Orleans railway?

Let us proceed rather more gently than our thousand horse power querist. This is an Irish invention, prompted most likely by Irish needs. There is the national electricity undertaking, at present called the Shannon scheme, and there are the experts who said, very wisely, in their report that the electrification of the Irish railways would be uneconomic, with the possible exception of two short routes with relatively high traffic density. At that time there was no alternative to the continuous collection system; storage batteries were definitely not in the picture.

Since then the railways have had to face the menace to their passengers and goods revenue of the modern road vehicle, and the Drumm battery has been invented. Every pound of coal used on the railways has to be imported; hence, every pound saved is so much towards the reduction of an adverse trade balance. Every gallon of petrol and lubricating oil used on the road vehicles is imported.

It is at least possible that rail traction may find its renaissance in frequent headway of single waggons and coaches, or light trains. That would reduce our 1,000-h.p. to 100-h.p., and would spread the demand over a more reasonable period of the working day. On a 200-mile run the essentially express feature of the schedule could be maintained by the provision of 25 miles of third rail. Transmission to the feeding points would be carried out at 38,000 volts from the national secondary feeders.

If the Drumm battery is the success which everyone in the Irish Free State hopes it will be; if the patents can be upheld all over the world, which we have no reason to doubt, not knowing anything about it; not only Prof. Drumm, but the State also, will reap a monetary harvest which can be made as abundant as our individual imaginations permit.

The universal adoption of alternating current has presented serious problems to the lead battery maker. Should the immense field of railway electrification, and other fields yet unknown, be thrown open to him through the Drumm battery, those problems will become less serious, and the industry will enter, together with the railways, upon an era of renewed life and prosperity.

World Power Conference Transactions.

The transactions of the second World Power Conference, which was held at Berlin, Germany, in June, are about to be published in 19 volumes and an index volume (Royal 8vo, full bound cloth, lettered in gold) at a special pre-publication price of £15, which will be increased to £17 10s. after September 15th. Readers are reminded that separate volumes are obtainable at the reduced prices (from £1 to £1 10s. each) if ordered at once from Messrs. Percy Lund, Humphries & Co., Ltd., 3, Amen Corner, London, E.C.4.

Electricity Supply Progress.—I.

The main trends of development by authorised undertakers in Great Britain between the years 1921 and 1928, as revealed by official statistics.

By R. S. H.

IT is first of all necessary to define roughly the term "Authorised Undertaker" and to indicate the field which is covered by the statistics under examination. An "authorised electricity supply undertaker" may be a municipality or joint board representative of several municipalities, or a public company. Authorised undertakers, of whom about 650 at present constitute the authorised electricity supply industry in Great Britain, were created by orders of the Board of Trade or, of recent years, the Electricity Commissioners, or by special Acts of Parliament; they are granted, in effect, the monopoly of the sale of electricity in the areas of supply conferred on them; in return they have to comply with numerous conditions with regard to prices charged, the giving of a supply to anyone requiring it, &c. Usually in the case of company undertakers, local authorities in the area of supply have the right to acquire the company's undertaking on certain prescribed or agreed terms. The setting up of an authorised electricity supply undertaker for an area does not preclude any person or body from generating electricity for private purposes, and this is often done by large industrial establishments such as colliery, tramway and railway companies, and even by owners of private houses. Statistics in respect of the authorised electricity supply industry will not only exclude particulars of such undertakings but will also exclude particulars of public supply undertakings operated without a statutory monopoly. It has been estimated that in 1924 the total capacity of private generating plant in the country amounted to as much as 65 per cent. of that of authorised undertakers; it is anticipated that, with the construction of the Central Board grid and with other developments tending to reduce the prices charged by authorised undertakers, there will be an acceleration in the tendency for manufacturers and others to have recourse to supplies from authorised undertakers in lieu of installing their own generating plant (see Electricity Commissioners' Eighth Annual Report, p. 202 et seq.).

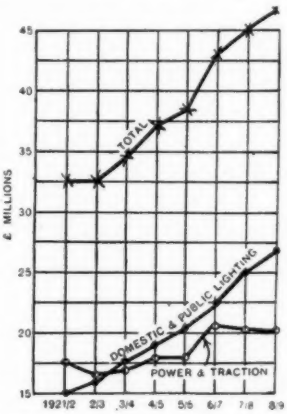


Fig. 3.—Annual Revenue from Sales.

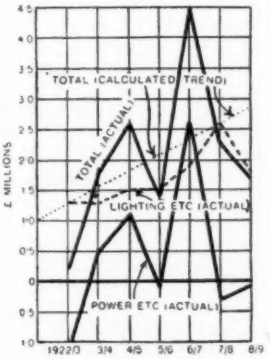


Fig. 4.—Annual Increase in Revenue.

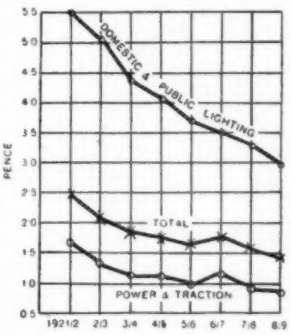


Fig. 5.—Average Revenue per kWh Sold.

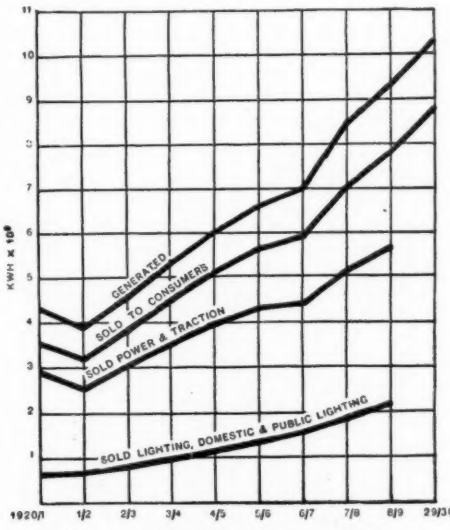


Fig. 1.—Annual Output and Sales.

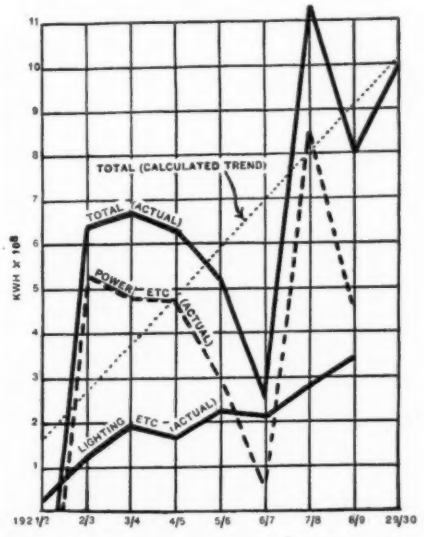


Fig. 2.—Annual Increase in kWh Sold.

The author now proposes to use the statistical information published by the Electricity Commissioners and to derive therefrom the main tendencies in the operation of this great and rapidly expanding industry in the period named. In previous articles* it has been indicated that in the opinion of the author all costs and other figures should so far as is possible be tackled from the point of view of the consumer; for instance, coal consumption should be considered per kWh sold. It is

* Electrical Review, January 31st and June 13th, 1930.

obvious that if a generating station is remotely situated as regards the point at which a supply is required the total coal consumption may be higher than if energy be generated at a less efficient station situated close to the supply point, for lower transmission and distribution losses may more than compensate for the higher coal consumption; similarly, costs should be considered per kWh sold to the consumer, and here the considerations used in the illustration above apply equally well—a reduction of costs at a distant generating station, such as a pit head station, may not balance heavy transmission costs.

The main source of information is, of course, the Return of Engineering and Financial Statistics. By reason of circumstances which presumably they cannot control the Commissioners have to publish figures covering periods which do not coincide. In general, information in respect of companies is for the year ended December 31st; in the case of English municipalities it is for the year ended March 31st, and for Scottish municipalities it is for the year ended May 15th. In arriving at their published total figures the Commissioners apparently add the figures printed and make no adjustment for the fact that the figures are in respect of these three non-coterminous periods. However, it appears that the error is not substantial and that the method provides sufficiently accurate indices for practical purposes, as in two cases the figures can be checked from alternative figures published in the annual report for co-terminous periods; these figures are the total kWh generated annually and the total kWh sold to consumers annually, and are set out below against corresponding figures from the Return of Engineering and Financial Statistics.

A. Output.—First how has the output of the industry moved? The total number of kWh generated in the stations of authorised undertakers has moved as follows. (Hereafter "A.U." will be used as an abbreviation for "authorised undertaker" and "E. and F." for the "Return of Engineering and Financial Statistics.")

Number of kWh Generated in Stations of A.U.'s.
Thousand Million kWh.

Year ...	1920-1.	'21-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.	'29-30.
E. & F. ..	4.28	3.89	4.54	5.29	6.02	6.62	6.99	8.45	9.32	*10.30
Annual report (to Mar. 31st)	4 38	3.90	4.57	5.40	6.05	6.70	7.06	8.55	9.47	10.47

* Estimated from figures immediately beneath.

Then how many kWh were sold to final consumers?

Number of kWh Sold by A.U.'s to Final Consumers (whether Generated in the Stations of A.U.'s or Imported from Other Stations.)
Thousand Million kWh.

Year ...	1920-1.	'21-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.	'29-30.
E. & F. ...	3.51	3.15	3.79	4.46	5.09	5.61	5.87	7.00	7.80	†8.80
Annual report (to Dec. 31st)	—	—	3.65	4.34	5.00	5.52	5.72	6.85	7.60	8.60

† Estimated from figures immediately beneath.

There is available a rough analysis of kWh as between two classes of supply; the first is lighting and other domestic supplies and "public lighting," consisting almost entirely of low pressure supplies (*i.e.*, up to 250 volts), and the second is power and traction, consisting of a large proportion of supplies at higher voltages; the analysis is as follows:—

Analysis of kWh Sold.
Thousand Million kWh.

Year ...	1920-1.	'21-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.
Power and traction...	2.88	2.49	3.02	3.50	3.97	4.27	4.33	5.18	5.64
Lighting, domestic & public lighting ...	0.63	0.65	0.77	0.96	1.12	1.33	1.54	1.82	2.16

Now the question which interests many of us most is "what is the rate of expansion?" This is more clearly indicated by working and graphing out the annual increase in the number of units sold and calculating a line representing its trend; the actual figures are:—

Approximate Increase in the Number of kWh Sold to Consumers Each Year Over the Preceding Year.
Thousand Million kWh.

Year	1921-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.	'29-30.
Total	(−)0.36	0.64	0.67	0.63	0 52	0.26	1.13	0.80	1.00
Power, &c. ...	(−)0.39	0.53	0.48	0.47	0.30	0.06	0.85	0.46	—
Lighting, &c. ...	0.02	0.12	0.19	0.16	0.22	0.21	0.28	0.34	—

It is of interest to apply the calculated trend line for the yearly increases in the actual total kWh sold to the latest number of kWh sold to consumers with a view to anticipating future sales; it suggests that sales in the year 1934-35 will reach 15½ thousand million kWh, or about double the number sold in the year 1928; a rough calculation shows that the supplementary particulars to the Central Board schemes anticipate the sale of about 13½ thousand million kWh in that year.

In view of the fact that it is proposed to reduce many costs and other averages to a "kWh sold" basis instead of the usual "kWh generated" basis it is desirable that the relationship between kWh generated and kWh sold to consumers should be calculated. As has been indicated earlier the total kWh sold includes supplies imported from outside generating stations, therefore a direct relationship is not immediately available. An approximate ratio, however, can be calculated by multiplying the ratio kWh sent out divided by kWh generated in the stations of A.U.'s by the ratio kWh sold to consumers divided by (kWh sent out from A.U.'s stations plus kWh imported from outside stations). It will be found that the ratio kWh "sent out" divided by kWh generated lies in general between 0.93 and 0.94 while the ratio kWh sold divided by kWh "sent out" lies mainly between 0.860 and 0.865; the ratio kWh sold divided by kWh generated has moved mainly between 0.80 and 0.81 with a slightly upward tendency; it is probable that with the introduction of the Central Board grid and other long distance transmission that this tendency will be reversed, but in this review it is proposed to use the figure of 0.805.

On graphs in figs. 1 and 2 are set out the more important figures so far discussed. In fig. 2 the increase in kWh sold each year is in relation to the output of the preceding year.

B. Revenue.—The next question is "what revenue was received from the sale of current? The figures with the average price per kWh sold were as follows:—

Revenue from Sale of Current.

Year ...	1921-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.
Total £ millions	32.5	32.7	34.5	37.1	38.5	43.0	45'3	47.0
Per kWh sold, pence ...	2.48	2.07	1.86	1.75	1.65	1.76	1.55	1.45

Power and Traction.

Year ...	1921-2.	'22-3.	'23-4.	'24-5.	'25.6.	'26-7.	'27-8.	'28-9
Total £ millions	17.6	16.5	17.0	18.1	18.0	20.6	20.3	20.2
Per kWh sold, pence ...	1.69	1.31	1.17	1.10	1.01	1.14	0.94	0.86

Lighting and Domestic and Public Lighting.

Year ...	1921-2.	'22-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.
Total £ millions	14.9	16.2	17.5	19.0	20.5	22.4	25.0	26.8
Per kWh sold, pence ...	5.50	5.06	4.37	4.06	3.69	3.50	3.29	2.9

It will be seen that the yearly increases in revenue from the sale of current were as follows:—

Increase in Revenue from Sale of Current Each Year Over the Preceding Year (£ Millions).

Year	1922-3.	'23-4.	'24-5.	'25-6.	'26-7.	'27-8.	'28-9.
Total	0.2	1.8	2.6	1.4	4.5	2.3	1.7
Power, &c.	(−)1.1	0.5	1.1	(−)0.1	2.6	(−)0.3	(−)0.1
Lighting, &c. ...	1.3	1.3	1.5	1.5	1.9	2.6	1.8

The application of the trend which has been calculated for the annual increase in total revenue suggests that in 1934-35 the total revenue will have reached the figure of £70 millions, so that the average revenue per kWh sold (using the estimate of kWh sold previously advanced) works out at 1.08d. as compared with 1.45d., the actual figure for the year 1928-29. Both the estimated revenue and the estimated sales are probably a little on the high side, but this average price may not be far out. Beyond that, even if as far, it is unwise to go, as the Central Board will be getting into its stride and we hope will be bringing down costs; on the other hand, of course, the price of coal may rise and local rating assessments may not yet have reached their zenith.

In the graphs in figs. 3, 4, and 5 are set out the more important figures mentioned in this section, and, as in the case of output, the irregularity in the increases in power revenue as compared with the increases in domestic revenue is painfully apparent.

Electricity for the Home.

Brief Particulars of Recently Introduced Domestic Appliances.

A SYSTEM of low-temperature heating by a combination of radiation and convection, with convection reduced to the barest minimum, is the result of an invention of Mr. A. H. Barker, and it employs "Electrorad" panels which are marketed by Electro-Gas Development Co., Ltd., 3, Arundel Street, W.C.2. The "Electrorad" panel, fig. 1, is essentially a flat cast-iron plate of high radiativity designed for securing flat to wall or ceiling. The plate is warmed uniformly over its surface by means of two removable electrical heating elements located in two longitudinal channels cast integrally with the plate. The plate itself is of sectional construction, each section being 16 in. long and either 18, 24, or 30 in. wide. The panels may be built into lengths which are multiples of 16 in. in either of the three widths mentioned. At the end of each panel is a small so-called "dummy section" of the same external appearance as the panel, which is designed to cover completely all external connections, thus giving the panel when fitted the appearance of a flat plate. The edges of the plate are moulded over to give the effect of beading, and in many cases it serves a useful decorative purpose in breaking up large expanses of open wall into definite sections. "Electrorad" panels are manufactured in two types, each of which is available in the three widths and five lengths. Type "A" or commercial-pattern panel projects 2¼ in. from the surface of the wall or ceiling, and its elements are located in round channels on the back of the plate. It is supplied with either moulded edges for fixing on the surface of the wall, or with flanged edges for recessing into the plaster or concrete. In many cases where the rooms to be heated do not exceed 12 or 13 ft. in height this type of panel can be mounted 2 in. away from the wall, thus allowing the air to circulate up the back, and so converting the panel from a pure radiant appliance to a semi-radiant and convective one. The type "B" "Electrorad" panel is of the same general design as type "A," with the exception that it is much thinner and lighter in construction, and is especially suitable for use in places where appearance is of prime importance. It is supplied in the same sizes as those of type "A," but owing to its light construction it is not found desirable to mount it away from the wall to allow for recirculation of air. The average surface temperature of an "Electrorad" panel is 170 deg. F., and to maintain this a loading of 80 watts per sq. ft. of surface area is employed. Briefly, the loadings employed are as follows: 30 in. by 16 in. section, 270 watts; 24 in. by 16 in. section, 220 watts; and 18 in. by 16 in. section, 170 watts. At the back of each panel is fitted a piece of asbestos millboard, covered with aluminium foil. The effect of this is to reflect the beams of radiant heat back on to the panel, thus making the heat losses into the structure of the building practically nil.

Fig. 1.—An "Electrorad" Panel.

"Electrorads" in the form of imitation cast-iron skirting boards, for use where the wall space is restricted, are shortly to be introduced.

An Improved Cooker.

The "Dolphin" 514 cooker, fig. 2, a production of Domestic Electrification, Ltd., Townsend House, Greycoat Place, S.W.1, has been designed particularly to meet the requirements of a family of 4 to 5 persons. It is distinctly out of the "Baby" class, as the available cooking space in the oven is 14 in. by 12 in. by 12 in., while by means of side extension pieces the hob can be increased from 19 in. by 16½ in. to 28 in. by 16½ in. The oven elements are in the top and bottom of the oven, each controlled by a three-heat switch, and for compactness and convenience, in a cooker of this type, the top oven element forms the grill; this arrangement allows for two boiling plates being placed in the hob, and also ample space for plate warming in the oven. A dividing shelf is provided, so that the top or bottom half of the oven only need be used when one small dish is being cooked. The whole of the elements are of the "plug-in" type.

This cooker should prove very useful for housing schemes, where the maximum of cooking space is required in a sound frame.

Fig. 2.—The "Dolphin" 514 Cooker.

A special and new feature of the "Dolphin" cookers is that they may be had in a variety of pleasing mottled colours, not only grey, but also cinnamon brown, pink, green, blue, &c., and also in self colours, *e.g.*, turquoise blue with white door panels, French grey with fawn door panels, and so on.

The Road Traffic Act.

New Regulations for the Industrial User.

By J. W. PARKER, A.M.Inst.T.

SUCH a comprehensive and far-reaching piece of legislation as the Road Traffic Act which is now on the Statute Book must necessarily go beyond the needs of the industrial user. None the less, there is a great deal in Part I of the Act which actually concerns all those who send goods by road. For the first time, an attempt has been made to bring up to date the various legal requirements concerning mechanical transport and to revise along commonsense lines some of the most arduous restrictions.

For legal purposes, all vehicles are classified into definite divisions, principally upon a vehicle basis. So far as goods vehicles are concerned, there are five classes, the first three being tractors as distinct from carriers, their various designations being arrived at entirely according to unladen weight. Heavy locomotives are those weighing upwards of 11½ tons, of which a heavy traction engine of the kind used for hauling cable drums, transformers, and other outsized pieces, may be taken as a typical illustration. The light locomotive is also a tractor within the limits of 7¼ and 11½ tons, whilst a motor tractor is of similar construction, but weighing not more than 7¼ tons. The heavy motor car is a carrier, the unladen weight of which does not come below 50 cwt.; if the weight is less than this, the vehicle is in class "E," and is designated a motor-car.

According to Section 16, both heavy and light locomotives must have two persons in charge, but their employment on heavy motor-cars is not compulsory. As originally drawn up, the Act prohibited any one under 21 from driving a heavy or light locomotive or heavy motor-car, but in view of the large number of drivers under that age actually handling these vehicles, an exception was made whereby an employé who could show six months' continuous driving experience at the time of the passing of the Act would be allowed to continue.

The two phases of outstanding difficulty to goods operators, however, are the speed schedule and the hours clause. Whilst on his part, the private car owner has been freed from an absurd speed limit, the commercial user is to be subjected to some half-dozen varying maxima rising from three miles an hour to 30, according to the legal classification, the tires and the number of trailers. Although the schedule as now amended is more satisfactory than the original, it is still not entirely acceptable to all classes of users. It must be admitted that the only way out of the dilemma would have been to increase the number of permissive speeds, a course which would have rendered the task of enforcing this part of the Act nearly impossible. As it is, there exists considerable speculation as to how the varying speed limits will be enforced. One school of thought inclines to the belief that with no private car limit to enforce, the police will be able to give their undivided attention to the commercial vehicle driver, who will be watched more closely than hitherto. The greatest defect in the schedule is that it holds down the light truck and van to an unreasonably low maximum rate. These vehicles are really as well braked as a private car and might reasonably have been put on the same basis.

The other point of criticism is directed towards Section 18, which provides for the limitation of working hours to 11 per day, consisting of two periods of not more than 5½ hours' continuous duty. This restriction must be taken in conjunction with the speed limit, the combined effect of which is to fix within new and lower limits the amount of work which can be done in the course of a day. No objection is made to the principle of limitation, but to the way in which it is applied. If the maximum were fixed for the week, instead of the individual day, practically all industrial situations would be satisfactorily met. One of the outstanding advantages of mechanical road transport has always been the high degree of flexibility in working hours which resulted in the work of any given industry being properly handled, even when it came in rushes.

Some electrical firms have found that the chief benefit of owning their own mechanical vehicles has been the great rapidity with which they could be made available for urgent and unexpected runs, breakdown jobs, and last-minute orders. In the retail trade, and in service and supply deliveries, the restricted effect of the hours clause is likely to have appreciable consequences. Its operation is rendered the more difficult by the provision which considers the driver to be on duty so long as he is engaged in any capacity in connection with the vehicle. This includes loading, unloading, waiting, and so on, outside the duly prescribed hours, and apparently the driver will not be able to garage his vehicle beyond the restricted hours without breaking the law. He will only be excused if he can prove to the Court that the contravention was due to "unavoidable delay . . . which he could not reasonably have foreseen." The individual firm cannot alleviate these conditions, but a trade body, providing it is duly recognised for the purpose, is authorised to petition the Minister to vary the hours for any particular trade. Answering a question on this point in the House, the Minister of Transport made it clear that the word "vary" included power to extend hours. It is as yet too early to know how this section will function in practice.

For the hauling of heavy electrical machinery like dynamos, transformers, &c., tractor-trailer working is increasing in popularity, especially for short hauls; consequently, the exact provisions as to trailer working have become important. Locomotives, whether heavy or light, may have up to three trailers, motor tractors one loaded and two empty, and motor-cars one. One man, in addition to the driver, is necessary where one or two trailers are hauled, and one additional man for each trailer over two.

Heavy electrical equipment is concerned with the overloading of vehicles and the corresponding provisions designed to deal with any infractions of the rule. A police constable, or other authorised officer, can require the driver to proceed to a weighbridge for the purpose of ascertaining whether or not there is any degree of overloading. No one, however, can be compelled to unload the vehicle merely for the purpose of checking the unladen weight. The user is protected from abuse by a clause in his favour, which lays down that if the vehicle has to go for more than a mile in order to be weighed, and it is found to be within the permissible limit, the responsible highway authority "shall pay in respect of the loss occasioned such an amount . . . as may be agreed by the parties." In effect, therefore, it is most unlikely that vehicles will be called upon for weighing outside the mile limit.

Once a motor or trailer has been weighed under this section, a certificate to this effect must be issued exempting it from being weighed again so long as it continues on the same journey carrying the same load.

Very wisely, no attempt has been made in the Act to define actual design, dimensions, or construction of vehicles, it being recognised that these are liable to alter from time to time, and that if they were determined by Act of Parliament progress would be unduly hampered. For this reason, full power has been left with the Ministry of Transport to deal with these questions by means of Orders which can be amended, revised, or withdrawn with much less trouble than could an Act. Such matters as width, height, and length of vehicles, excessive noise, number and nature of brakes, steering, signalling devices, and other matters are consequently within the discretion of the Minister. Part II, dealing with third-party insurance, and parts 4 and 5 of the Act, devoted to passenger-vehicle requirements, are outside the scope of this article.

Whilst the general purpose of the Act makes it very welcome in industry as promising to abate the present chaotic state of road transport, the speed schedule and the hours clause between them are sure to force up working costs and to affect marginal traffic by driving it into the hands of competing forms of carriage. The movement is likely to develop in two directions: so far as long-haul work is concerned, the railways will benefit, as some traffic now passing by road will revert to rail. The hours of employment have long been regulated in railway work, hence the Road Traffic Act will tend to equalise conditions between the road-rail rivals. It is, however, not clear that any advantage will remain with the railways, as past experience goes to show that motor designers and operators have usually been able to reduce working costs so as to redress the balance. In the other direction, short journeys will favour a return to horse transport. The present Act is confined to mechanical vehicles, notwithstanding various attempts having been made to extend its limitations to horse vehicles as well. As things are, the economic sphere of the horse has gradually increased during the past decade, and will now be further extended; in fact, some firms have already increased their horse conveyances, for no other reason than to escape the disadvantages of the hours clause.

The Electric Organ.

Some notes on the intricacies of construction which often includes the provision of as many as 100,000 silver contacts.

By G. B. FULLER.

IF the electrical student with only a smattering of knowledge of the design and construction of electric organs can at the outset liken them to telephone exchanges, he will have made a good beginning towards understanding at least some of their intricacies.

A glance at the diagrammatic drawing of the Christie unit organ installed in the Regal Theatre, Marble Arch, was my first acquaintance with the " insides " of these modern music makers. It revealed to me just a minute portion of the well-nigh incomprehensible detail, but it left more unrevealed.

Mr. Norman, one of the directors of William Hill and Son and Norman & Beard, Ltd., London, showed me the plan of the " Regal's " organ—the largest of its kind in Europe. His firm has built many famous organs—electric and otherwise. The organs at Westminster Abbey; Queen's Hall; the Central Hall, Westminster; the private chapel at Buckingham Palace (that organ was built in 1859); the Chapel Royal, St. James's; St. Martin's-in-the-Fields; Melbourne Town Hall; and Battersea Town Hall are some of them. The firm is now engaged on the new console of the Peterborough Cathedral organ, which will be completely installed within a few weeks. Organs from this Camden Town factory are installed in Australia, Czecho-Slovakia, Germany, and New Zealand—to name but a few countries—and, of course, they are installed in many cities and towns throughout the British Isles.

Mr. Robert Hope-Jones, M.I.E.E., a telegraph engineer, was the "father" of the present-day electric organ. He developed both the solenoid valve and the rocking tablet, without which the arrival of the electric organ as a practical proposition would have been long delayed.

The keys of electrically-equipped organs are actually super-sensitive electric switches. Their contacts are pure silver in the form of wire. From these contacts, enamelled and double-cotton-covered wires of 28 gauge are run to the junction board within the console casing. Each manual, or keyboard, has 61 keys, and each key has more than one contact, sometimes as many as nine. The group of wires from each key is made composite by being taped. From the junction board in the console to a similar board in the organ action, the wires are run as a multicore cable; fire-resisting asbestos-covered wires are largely used, and the whole of the organ is enclosed in teak casing. Up to 12 multicore cables are often required, each cable containing 70 or 100 cores.

The organ action consists of relays and switches, the relays being electro-pneumatic. Air pressure is the prime agent. The principle of the relays is a simple one. A small electro-magnet operates a pneumatic valve, which in turn admits and releases air to and from the pneumatic motors or bellows. The valves are generally high-resistance solenoids with disk armatures. Nominally, the air pressure keeps the disks against their seatings. As soon as their companion keys are touched and contact is made, the disks are released and air passes through. When the bellows collapse the air obtains ingress and sounds the pipes. The release of the keys breaks the circuit and again releases the disks which take up their normal positions.

The function of the relays is to distribute an electrical impulse from any one key over the complete number of circuits controlled by the tones to be played from that key. The contacts of the relays are from 9 to 40 in number: they are wired with 28-gauge double-cotton-covered wire to group switches of 61 contacts, when the

wires are again taped to form a multicore cable. The contact material of the switches, which are self-aligning and self-adjusting, is phosphor-bronze. From the switchboard busbars, current is carried by 28 gauge enamelled double-cotton-covered wire, made up with tape, to the electro-magnetic primary valves of the electro-pneumatic action of the organ sound board. The pipe action is operated on the " unit " principle, there being one valve for one pipe. In one organ there are often as many as 500 or more electro-magnetic valves.

From 12 to 15 volts is required to operate one of these modern organs, a special generator being coupled to the organ-blowing fan, from which there are leads of v.i.r. wires to the main terminals in the organ, the sizes varying according to the size of the instrument. The distribution from the terminal board is carried out in v.i.r. wires of the same size as those to the main terminals, the return wires to the sound board and to the relays being bare copper.

The electrical connections to the moving parts of the relays are by copper braid, all other wiring being done with gauge 28 enamelled copper wire. The general insulation throughout is by means of " Henley " tape. After assembly, all parts are shellac polished to prevent peeling and the like.

Although electricity is used, it functions more as the agent of transmission than as that of power, for the actual operation of the main air valves is accomplished by compressed air; yet electricity remains as the most sensitive means of control. It is actually transformed into wind for the purpose of operating the small pneumatic bellows, which vary in size and are covered with fine lamb-skin. In a later operation, the wind is transformed back to the controlling element.

The organist controls the quality and the quantity of the tone by means of stop-keys, the depressing of which closes a circuit similar to that of the playing-key action. The depression or release of these stop-keys puts in or pulls out the 61 note switches connecting the 61 notes to the series of pipes, thereby controlling the various " effects."

In the average two-manual organ are about 40 miles of 28 gauge wire, and in a three-manual one something in the neighbourhood of 100 miles. All the cable used for Christie organs to-day is of Henley's manufacture. The junction board in the console, which has been previously mentioned, is ingeniously numbered and lettered, so that defects are easily traceable.

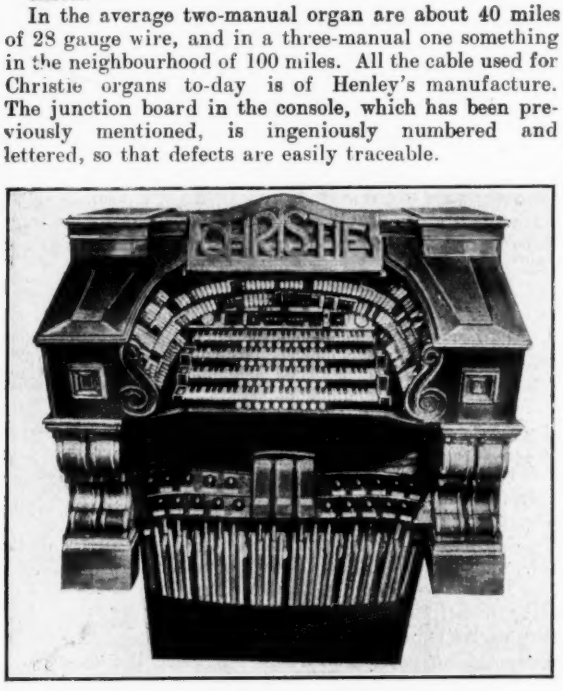


Fig. 1.—A Modern Organ Console.

Large magnets, I understand, have been proved unsatisfactory for electric organ work. The reduction in size, not only of the magnets, but also of many of the other important yet comparatively small parts, tends to greater reliability.

In the small space available in the organ console every detail is so arranged that it becomes readily accessible for adjustment and repair. Repairs, however, seem to be seldom necessary. Each of the banks of keys can be removed within a few moments, and approach to the many hundreds of silver contacts becomes immediate. The mechanism is really simple, but it looks complicated merely because of the amount of duplication necessary. There are 100,000 or so contacts and, in the kinema organ, dozens of " effects," all manipulated by the mere touch of a key—glockenspiel, xylophone, castenets, cock crow, and the rest; and, of course, the electrical work is

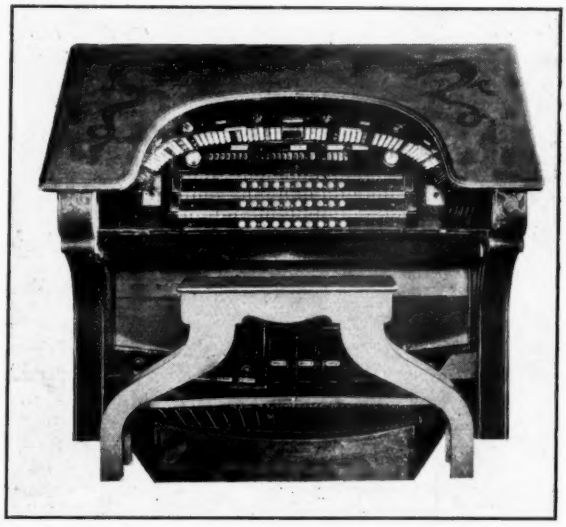


Fig. 2.—Manual and Pedal Keyboards.

but a portion of the whole. Joiners, smiths, and many other skilled craftsmen help to produce these masterpieces of the organ-builders' art. Every single contact of the 100,000 or so in a modern electric organ has a separate function to perform. Each must be carried out with unfailing precision and efficiency.

Aluminium Protective Plating.

A very informative paper on the protection of aluminium and its alloys by the deposition of zinc was recently read before the Electroplaters' and Depositors' Technical Society, the work described being based on results of investigations made by Dr. H. C. Cocks at the Royal Aircraft Establishment, Farnborough. He compared deposits obtained both from sulphate and cyanide zinc baths, and obtained excellent results with both types of deposits, although the protection afforded by " sulphate " zinc was superior. Careful observations extending over two years showed that practically all the deposits from sulphate baths gave very good protection. No consistently marked differences were found, however, between the deposits obtained from four sulphate baths, nor between those deposited at 10 or 30 amperes per sq. ft. nor between those from solutions at Ph5.0 or Ph4.0. After exposure to sea-water spray for about one year, it has been found that the degree of protection afforded by deposits from cyanide baths, although good, is not so good as that afforded for a corresponding time, by the deposits from sulphate baths. Contrary to expectation, deposits from an ammoniacal zinc cyanide bath have not shown any appreciable superiority over those from a sodium zinc cyanide sodium zincate bath. The sulphate and cyanide baths gave deposits affording good protection to mild-steel test pieces. Zinc sulphate baths are to be preferred for deposition on aluminium alloys, except in the case of plating irregularly-shaped articles. On the whole, a sulphate bath containing gum arabic is to be recommended, the working conditions being a current density of 30 amperes per sq. ft. and the solution at Ph4.0.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The Buenos Aires Exhibition.

Owing to the greatly increased importance now assumed by the British Empire Exhibition to be held at Buenos Aires in March and April, 1931, the British Government has decided to treble the sum to be expended on its official participation in the Exhibition. This large increase will allow a considerable part of the impressive British Government exhibits shown in the Antwerp Exhibition to be sent out and adequately displayed at Buenos Aires. The management of the Exhibition has placed one of the finest buildings in the grounds at the disposal of the Government, and the decorations of this hall and the arrangement of the exhibits will be in the hands of the Department of Overseas Trade. The desire of British manufacturers to exhibit in the trade sections of the Exhibition has been so great that it has been found necessary to provide more than double the covered space originally designed, and although the grounds and buildings cover more than twenty-five acres, it will be difficult to fit in all who wish to participate.

Buenos Aires Subway Scheme.

The *Financial News* reports that the special sub-committee of the Buenos Aires Municipal Council, which has had under consideration the offer of a syndicate to construct an underground system in the city at a cost of $560,000,000 have reported favourably on the project, and the offer will be put up to the Municipal Council. The proposed concession is for a term of 80 years, after which the service will be handed over intact to the municipality without any further compensation whatever. The municipality will reserve to itself the right to intervene in the administration of the company after 75 years of the concession has expired, in order to ensure the carrying out of the clause regarding the surrender of the service.

On the other hand, according to the *Review of the River Plate*, the executive of the Municipality recommends the rejection of the offer, which was made by a Spanish concern, the Cia. Anonima de Proyectos y Construcciones de Madrid. Several reasons for this recommendation are given.

"Rationalisation" or Healthy Reconstruction?

We reproduce below a letter from Mr. R. Arthur Mills, Associate Member, International Management Institute, Grossenbaum, near Düsseldorf, which appeared in *The Times* of August 14th:—"Many Englishmen have fallen victim to a fatal word. The Germans do not now use the word *Rationalisierung* lest it should call to mind instances of capital wasted, and factories laid idle during a long period of uncertainty in the Reparation question. They speak rather now of *Sanierung*, meaning a healthy reconstruction of industry on economic and humane lines, and such a policy has everywhere the hearty encouragement of all classes of employed. We Englishmen are not working, and have never worked, under the uncertainties of an indeterminate debt, and there is no reason therefore why we should not proceed with the healthy reconstruction of our industries without regrets for undue waste of capital or idle factories in the past. If it be objected that private enterprise is thereby strangled, let statistics be cited of America and Czecho-Slovakia, where the old and the new giant industries may be found, to show that small businesses were never so flourishing as now."

Hydro-electrical Development in Uruguay.

The Bank of London and South America in a recent report stated that the Government of Uruguay had contracted with a German engineer to study the possibilities of developing hydro-electric power from the Rio Negro. Herr A. Lukin, the expert in question, found that this could be effected without any technical or economic risk whatever. In view of this report the National Administrative Council has gone into the question. In support of immediate action it has been pointed out that the value of the imports into Uruguay of coal and mineral oils increased from an average of $41,000,000 in 1920-24 to an average of over $74,000,000 in 1925-29. The estimated cost of the Rio Negro project is $20,000,000, and it is calculated that by carrying it out, half the sum at present spent on imported fuel could be saved.

New Showrooms at Stroud.

The Stroud branch of the Western Electricity Supply Co., Ltd., which is associated with Edmundsons', has opened new offices and showrooms at Kendrick Street, Stroud. The building is also used as a district office for the towns of Malmesbury and Tetbury, and is under the control of Mr. W. F. Brown. The showroom measures 24 ft. by 18 ft., and is provided with a modern bronze shop front with a frontage of 18 ft., giving ample space for window displays. The decoration scheme and general equipment of the showroom closely resembles the design of other W.E.S. Co. branches. Special consideration has been given to the provision of simple facilities for appliance demonstrations, &c.

Belgian Radio Exhibition.

The annual Belgian Radio Exhibition is to be held at the Parc du Cinquantenaire, Brussels, from October 18th to 27th next. Particulars as to space, &c., can be obtained from the Secretariat Générale, 59 Avenue Fonsny, Brussels.

The Economic Situation in Sweden.

According to *Reuter's Trade Service* (Stockholm) the monthly review of economic conditions in Sweden published by *Svenska Dagbladet* points out that the supply of capital at present is very good and that the banks have a large amount of ready money. The seasonal relaxation on the money market this year has evidently been accentuated by the reduced trade turnover, which is a consequence of the international depression. Swedish economic life is now without a doubt beginning to feel the effects of this depression. Some industries, however, are still doing well, the engineering industry, for instance, where producers of special products, *e.g.*, the L. M. Ericsson Telephone Company and the Elektrolux concern, are fully employed. The electrical industry also has a very good supply of orders, and the brisk activity at the shipyards is remarkable considering the fact that shipping is influenced by the depression.

Conditions in Rumania.

In the course of a D.O.T. report on this subject (Stationery Office, 1s. net), Mr. R. J. E. Humphreys, Commercial Secretary at Bucarest, says that although the effects of the stabilisation of the currency were not very noticeable during the first year of its operation, it will prove to be of benefit to the country in the long run. At the date of the report (May, 1930) the curve of trade depression seemed to have reached its lowest point, and general opinion inclined to the belief that the long-expected improvement was in sight.

Reported Purchase of Macintosh Cable Co.

With reference to the note which appeared under this heading in our issue of August 8th, the board of the Dunlop Rubber Co. announced last week that it had disposed of its interest in the Macintosh Cable Co. on favourable terms. Although the name of the purchaser was not divulged, it is said to be British Insulated Cables, Ltd. The Dunlop Company acquired the business in 1926 with the rest of the Macintosh rubber-manufacturing companies. In addition to cable-making, the Macintosh company has extended into other branches of electrical manufacturing, and its activities have become increasingly removed from the normal scope of a rubber manufacturing concern.

Oil-engine Sets for South America.

Mr. Joseph Meech, 19-21, Farringdon Street, E.C.4, informs us that while he was in New York recently he came into touch with a prominent engineering and shipping firm doing extensive business with South America which was desirous of receiving catalogues and prices of crude-oil engine generating sets (220 V, from 5 to 25 kW) with a view to taking over the sole agency for South America. Any interested British makers of this class of plant are asked to send their catalogues, &c., to Mr. Meech, who will forward them to the New York firm.

British Firms in the Dominions.

In a recent note under this heading *The Times* made a survey of the extent to which British manufacturers had organised production in Australia and Canada. After referring to the proposals of the General Electric Co., Ltd., to manufacture electric lamps at Newcastle (N.S.W.), and of the New System Telephones Pty., Ltd. (a subsidiary of the Telephone Manufacturing Co., Ltd.) to extend its Sydney factory, a list was given of concerns which had established branches in Australia during the last 10 or 11 years. The list included W. & T. Avery, Ltd., Babcock & Wilcox, Ltd., the Crittall Manufacturing Co., Ltd., Crompton Parkinson, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and John I. Thornycroft and Co., Ltd. Another list contained the names of concerns which had opened up in Canada, mainly since the war, and this included the Hart Accumulator Co., Ltd., the Lancashire Dynamo & Motor Co., Ltd., J. Stone & Co., Ltd., John I. Thornycroft & Co., Ltd., W. & T. Avery, Ltd., Babcock and Wilcox, Ltd., the Benjamin Electric, Ltd., the English Electric Co., Ltd., Ferranti, Ltd., R. A. Lister & Co., Ltd., Herbert Morris, Ltd., Siemens Bros. & Co., Ltd., and Yarrow & Co., Ltd. It was not claimed that these lists were complete.

Polish Tariff Concession Continued.

The *Board of Trade Journal* says that an Order dated June 24th, 1930, continues in force until December 31st, 1930, the provisions of previous Orders under which a reduced Customs duty, amounting to 35 per cent. of the normal duty, is payable on machinery and apparatus of kinds not manufactured in Poland, when imported into Poland to form a component part of newly-installed complete equipment of industrial establishments, or for the purpose of reducing costs or increasing industrial or agricultural production.

Local Exhibition.

Burnopfield.—The Burnopfield Agricultural Show, which was held on August 16th, included for the first time an electrical exhibition. This was promoted by the Tanfield U.D.C. Electricity Department, and arranged by Mr. C. V. Wedderburn. Throughout the day, demonstrations of electric washing, refrigeration, heating, &c., were carried out and some 5,000 people visited the exhibition marquee. Numerous inquiries were made, and the exhibition was considered very successful.

B.I. Boy Scouts.

A photograph received from British Insulated Cables, Ltd., illustrates one phase of the company's social activities, and is a further indication of the attention which is paid to the human side in the British electrical industry. It shows the managing director of the company, Mr. G. H. Nisbett, reviewing the B.I. boy scouts before they proceeded to camp recently.

New Indian Companies.

Among the companies recently formed in India are the Panchgani Electric Supply Co., 96, Duncan Road, Byculla, Bombay, capital 1,00,000 rupees; and the Peshawar Electric Supply Co., Lahore, Punjab, 5,00,000 rupees.

Swedish Foreign Electrical Trade.

The imports of electrical machinery into Sweden during June last were valued at £53,035, bringing up the total for the first six months of the year to £603 625, as compared with £440,920 in the corresponding half of 1929. The imports are small in comparison with the Swedish exports of electrical machinery, which in June last amounted to £240,880, making a total for the half-year of £1,567,935, as compared with £1,471,600 in the corresponding period of 1929.

Irish Free State Electrical Imports.

The official returns just to hand show that the imports of electrical goods into the Irish Free State during May last amounted to £49,765, bringing up the total for the first five months of the year to £233,143, as compared with £262,091 in the corresponding period of 1929. The first five months' imports of electrical machinery are returned at £119,672, against £168,596.

Spanish Electricity and Foreign Capital.

The Spanish Electric Power Committee is studying means of eliminating, or at least diminishing, the participation of foreign capital in Spain's hydro-electric enterprises.—*Reuter's Trade Service* (Madrid).

The Electrical Association of N.S.W.

Mr. Andrew F. O. Brown, secretary of the Electrical Association of New South Wales, notifies us that the address of the Association is now: The Grace Building, King, York and Clarence Streets, Sydney.

The American Trade Depression.

Reuter (New York) reports that American foreign trade in July ebbed to the lowest point for nearly a decade. The Department of Commerce figures give the July exports at $269,000,000, and imports at $219,000,000, being a decline in each case of more than 30 per cent. as compared with July last year.

Long-Service Awards.

It was announced last week by the Aldershot Gas, Water and District Lighting Co. that it intended to institute a scheme of long-service awards for co-partner employés of the company. For each 20 years of continuous service £5 per annum is to be credited to the withdrawable part of the employé's co-partnership account, and for each additional five years' service a further £2 10s. per annum will be credited. The scheme is subject to modification upon the introduction of a superannuation or pensions fund.

New Australian Companies.

The companies recently registered in Australia include the following:—New South Wales Insulators, Ltd., Marsh Street, Arncliffe, N.S.W. (capital £10,000), manufacturers of electrical insulators, electrical and mechanical engineers, &c.; and Magnavox (Australia), Ltd., Sydney (capital £10,000), manufacturers of, and dealers in, all kinds of electrical appliances, &c., connected with radio-telegraphy, telephony, &c.

Copper Production in Canada.

A Montreal correspondent of *The Times Trade & Engineering Supplement*, says that the announcement that the Eugene F. Phillips Electrical Works, Ltd., of Ontario, which is the principal producer in Canada of wire for electrical installations, has placed an order with the Ontario Refining Company for 5,000,000 lb. of copper bars for delivery in September and October, marks an interesting new stage in the development of the Canadian copper industry. Previously, the Eugene F. Phillips Electrical Works has been dependent on United States sources for copper bars and rods and the company has been handicapped in competition with United States manufacturers by reason of the fact that it has been required to pay the export price for copper, including a premium over the price charged to users of copper in the United States. Control of the electrical works was acquired recently by a group of British, United States, and Canadian interests, including the International Nickel Company of Canada, which owns 40 per cent. of the stock of the Ontario Refining Company, and the wire company will now obtain its copper from the new smelter at Copper Cliff, Ontario. Work will be begun this year on the construction of three additional units at the Brockville plant of the Eugene F. Phillips Electrical Works, as part of the important expansions programme of the interests now in control. Canadian Copper Refineries, Ltd., the subsidiary of Noranda Mines, Ltd., which is building a copper refinery at Montreal East, has placed substantial orders for electrical equipment with the English Electric Co. of Canada, the Canadian General Electric Co., and the Westinghouse Electric Co.

Stoneware Conduit for Canada.

H.M. Senior Trade Commissioner at Montreal reports that a local telephone company desires to get in touch with United Kingdom manufacturers of stoneware conduit. United Kingdom manufacturers of conduit can obtain particulars of the inquiry on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference B.X. 6704 should be quoted.

Foreign Issues in the United States.

During the second quarter of 1930 foreign issues totalling $804,688,214 (nominal) were made in the United States. The following were included in the list:—Berlin City Electric Co., $10,000,000; Central German Power Co., Magdeburg, $2,430,000; American and Foreign Power Co., $24,625,000; Piedmont Hydro-Electric Co. (Italy), $10,000,000; Calgary Power Co. (Canada), $544,500; West Canadian Hydro-Electric Corporation, $350,000; Iowa Southern Utilities Co. (Canada), $500,000; National Light & Power Co. (Canada), $100,000; Bell Telephone Co. of Canada, $3,750,000; Inter-Continents Power Co. (Latin America), $3,000,000; and the Italo-Argentine Electric Co., $3,500,000.

New Catalogues and Lists.

Relay Automatic Telephone Co., Ltd., Relay House, Streatham Hill, London, S.W.2.—A folder entitled "Who did it?" which records some of the most prominent contracts obtained by the company.

Callender's Cable & Construction Co., Ltd., 2, Surrey Street, Strand, W.C.2.—Pamphlet No. 108, describing and illustrating new Callender double service boxes.

I.T.C., Ltd., No. 1, Arundel Street, Strand, W.C.2.—An illustrated leaflet drawing attention to the "New System" telephone.

"Bull" Motors, Ltd., Ipswich.—A booklet containing illustrated particulars of "Bull" eddy current brakes.

English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Publications Nos. 838A, M.222 and M.23 describing, respectively, kiosk type sub-stations, the Cape Town suburban railways electrification, and the electrification of the Bombay suburban lines of the Great Indian Peninsula Railway. Illustrated.

A.E.G. Electric Co., Ltd., 131, Victoria Street, Westminster, S.W.1.—The London stock list for August and a leaflet describing synchronous motor-driven time switches for street and shop-window lighting. Also a brochure on illuminated colour fountains of interior decoration.

DOMESTIC ELECTRIFICATION, LTD., Townsend House, Greycoat Place, Westminster, S.W.1.—An illustrated folder dealing with the "Dolphin" electric cooker and giving reduced list prices.

L. BENN & Co., LTD., Colonial Avenue, Minories, E.C.3.—An illustrated catalogue of lamps, domestic appliances, cables, accessories, &c.

IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Publication No. 6,668 giving particulars of a new line of slow motion knobs and dials. Also information regarding the contents of the 1930-31 season's catalogue.

VIDAL ENGINEERING CO., LTD., Thornton Road, Croydon.—Descriptive leaflets of a new range of "Elect" domestic irons and soldering irons.

DIRECT ELECTRIC LAMP CO., LTD., 72, Shoe Lane, London, E.C.4.—Price list of lamps, domestic appliances, decoration sets, cables, &c.

Messrs. GENT & Co., LTD., Faraday Works, Leicester.—An illustrated folder advertising "Tangent" sound signals.

Messrs. A. C. SCOTT & Co., LTD., 39, City Road, Manchester.—An illustrated and priced leaflet giving particulars of the "Cromaloy" bathroom heater.

MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A poster setting forth the merits of the Model 47 all-electric radio receiver.

BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—A fortnightly stock list of motors and control gear, and an illustrated folder dealing with the company's squirrel-cage motors.

Book Notices.

We have received from Messrs. Percy Lund, Humphries and Co., Ltd., an advance prospectus of the *Transactions* of the second World Power Conference, which will be published in 19 volumes and an index volume. If ordered before September 15th, these volumes can be obtained at a pre-publication price of £15, or separate volumes at reduced prices. After September 15th, the price will be £17 10s. for the complete publication.

"The Selenium Cell: Its Properties and Applications," by George P. Barnard. Pp. xxix+331; figs. 258. London: Constable & Co., Ltd. Price 35s. net.

"The Modern Dowser: A Practical Guide to Divining," by Le Vicomte Henry de France. Pp. xv+134; figs. 11. London: G. Bell & Sons, Ltd. Price 3s. 6d. net.

"Television for All," by Charles G. Philp. Pp. 82; figs. 8. London: Percival Marshall & Co., Ltd. Price 1s. net.

We have received a copy of a "Dissertation on sheath losses in single-phase cables fed with a.c." (in German by Von Kurt Gocht. Published by Universitatsverlag Von Robert Noske in Borna-Leipzig.

Bankruptcy Proceedings.

H. A. KAPLAN, wireless dealer, 89, Elgin Mansions, Elgin Avenue, W., lately carrying on business at 37, Lisle Street, Leicester Square, W.C.—The receiving order in this case was made on July 29th upon the petition of V. Zeitlin & Sons, Ltd., wireless factors, and the first meeting of creditors was held on August 12th, when a statement of affairs was submitted showing liabilities of £610 and assets of 3s. According to the debtor's statements he began business in 1923 with a capital of £30 under the style of the Elkay Wireless Co. He traded successfully for 12 months and then formed Kaplan, Ltd., to acquire the business. Three or four months later he severed his connection with the company and formed the Standard Accessories Company, wireless factors. Twelve months afterwards the last-named company went into voluntary liquidation. In 1929 he became partner in a business of wireless dealers. He retired from that firm after five months and started by himself at 37, Lisle Street under the style of the London Surplus Depôt. In March last he formed the London Surplus Depôt, Ltd., to acquire the business, receiving as vendor 201 shares of £1 each and being appointed managing director at £10 per week. The company took over his assets but not the liabilities and it went into voluntary liquidation last June. The debtor attributes his insolvency to the failure of the company, to insufficient capital, and to severe competition. Mr. S. G. Cremis, C.A., was elected trustee of the estate with a committee of inspection. The following are creditors:—

	£		£
H. H. Lorie	34	Sel-Ezi Wireless Supply Co., Ltd.	110
United Dominions Trust	44		
Zelco, Ltd.	44	V. Zeitlin & Sons, Ltd.	284

L. O. RICHARDSON, electrical engineer, late of 205, Railton Road, Herne Hill.—The receiving order in this case was made on July 31st at the London Bankruptcy Court upon the petition of the Lithanode Co., Ltd. The first meeting of creditors was held on August 14th, when it was stated that the liabilities amounted to £200 against assets "nil." The debtor states that he began business in June, 1929, but it never paid. He attributed his failure to trade depression and family illness. The case was left with the Official Receiver to be wound up in bankruptcy.

C. W. C. OLIVER, wireless and gramophone dealer, lately trading at 60, Newington Green, N., under the style of "A. G. Browne & Co.," and at 10a, Manor Parade, Finchley, as the "Ideal Stores."—The adjourned first meeting of the creditors under this failure was held on August 14th at Bankruptcy Buildings, Carey Street, W.C. The debtor filed his petition on July 23rd. A resolution was passed for Mr. C. Latham, 78, New Oxford Street, W.C., to act as trustee of the estate.

C. JACKSON, 12, Silver Street, Whitby, Yorks., plumber and electrician.—The receiving order herein was made on the debtor's own petition recently, and according to a statement of affairs filed there are liabilities of £1,315, with assets of £191, leaving a deficiency of £1,124. The debtor attributes his failure to losses on contracts and bad health.

W. A. HOLLINGWORTH, wireless and gramophone dealer, 23, Princes Avenue, Hull.—First meeting held August 20th, at the Official Receiver's office, 37, Scale Lane, Hull. Public examination, October 13th at the Guildhall, Hull.

W. ROSS, wireless engineer, 35, Bridge Street, Haverfordwest.—Order of discharge adjourned *sine die*.

M. K. CLEMENTS (K. Raymond), wireless apparatus dealer, 27 and 28a, Lisle Street, Leicester Square, W.C.—Last day for receiving proofs for dividend, August 27th. Trustee, Mr. S. G. Crimes, 150, Southampton Row, London, W.C.

COLONEL TEMPEST, electrical engineer, 4, Mann's Court, Bradford.—First and final dividend of 9¾d. in the £, payable August 25th at 21-22, Prudential Buildings, Bradford.

E. TEMPLE & JANE E. BURKETT, trading as "The Westoe Electrical Co.," 105, Canterbury Road, South Shields, wireless dealers and electrical contractors.—Trustee, Mr. A. J. Gray, 48, Pilgrim Street, Newcastle-on-Tyne, released July 28th.

F. PRICE & C. R. TARVER, trading as F. Price, Tarver & Co., 15, Working Street, Cardiff, electrical engineers.—Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff, released July 28th.

H. GATESHILL, 113, Witham, Hull, wireless engineer.—Trustee, Mr. J. E. D. Stickney, Official Receiver, 37, Scale Lane, Hull, released August 1st.

J. T. NICHOLS, late of 4, Glebe Road, Kingsland Road, Dalston, wireless parts merchant.—Trustee, Mr. P. M. Mordant, 115-117, Cannon Street, E.C.4, released June 5th.

E. R. MILLWARD, trading as "The West of England Radio," 67, High Street, Barnstaple, wireless engineer.—Trustee, Mr. W. R. Cocks, Official Receiver, Exeter Bank Chambers, Broadgate, Exeter, released July 30th.

F. C. SMITHERS, lately of 117, Ashdon Road, Saffron Walden, Essex, electrical engineer.—Receiving order made August 12th on debtor's own petition. First meeting, August 25th at the Official Receiver's office, 41, Sidney Street, Cambridge. Public examination October 1st, at the Guildhall, Cambridge.

Company Liquidations.

GROSVENOR BATTERY CO., LTD.—This company is being voluntarily wound up for the purpose of reconstruction. A new company—Grosvenor Electric Batteries, Ltd.—has been formed to carry on the business.

IDEAL WIRELESS CO., LTD., Dorland House, 14, Regent Street, S.W.1.—First and final dividend of 5s. 1/3-16d. in the £, payable August 21st at the office of the liquidator, 133, Moorgate, London, E.C.2.

K.T.B. MANUFACTURING CO., LTD.—Winding up voluntarily. Liquidator, Mr. A. T. Chenhalls, 115, Chancery Lane, W.C.2.

BOSCH MAGNETO CO., LTD.—Return to be made to contributories at the rate of 10s. 0.07d. in the £; payable August 18th and subsequently at the office of the Official Receiver and Liquidator, 33, Carey Street, W.C.2. This is the second and final payment.

DURELCO, LTD.—Particulars of claims to be sent to the liquidator, Mr. H. A. Deed, 90, Cannon Street, E.C.4, by September 30th.

BRIDGES BOWER, LTD.—A meeting is called for September 15th at the offices of Messrs. Corfield & Cripwell, 119, Finsbury Pavement, E.C.2, to hear an account of the winding-up from the liquidator, Mr. W. A. J. Osborne.

GLEBE MANUFACTURING CO., LTD.—A meeting is called for September 19th at 5, Guildhall Chambers, 31-4, Basinghall Street, E.C.2, to hear an account of the winding-up from the liquidator, Mr. H. P. Harris.

Private Arrangements.

W. H. DICKSON, 20, Bridge Road, Blundellsands, electrician.—A meeting of creditors in this matter was held on August 12th, at the offices of Mr. Parkin S. Booth, Exchange Chambers, Bixteth Street, Liverpool. The statement of affairs showed liabilities of £1,173, and assets totalling £354. After allowing £51 for preferential claims, the net assets were £303, leaving a deficiency of £870. The present position was attributed to the fall in the turnover and the reduced prices through competition. It was decided that a committee of inspection should be appointed, and Mr. Booth was asked to communicate with the debtor's relatives, with a view to an offer being submitted. The following are creditors:—

	£		£
General Electric Co., Ltd.	102	Electric Lamp Factors ...	21
British Thomson-Houston Co., Ltd.	36	Liverpool Electric Cable Co., Ltd.	53
Clegg, Highcock & Co.	62	Owen Owen, Ltd. ...	27
Callender's Cable & Construction Co., Ltd. ...	31	Perrin Hughes & Co. ...	72
Downes & Davies ...	78	Pulford Bros., Ltd. ...	72
		Rowe Bros. & Co., Ltd.	72

Dissolutions of Partnership.

Aitken & Rush, electrical and radio engineers, Newcastle-upon-Tyne.—Mr. T. Aitken and Mr. J. Rush have dissolved partnership. Mr. Rush will carry on the business at 31, Westgate Road. The business at 42, Pudding Chare will be carried on by Mr. Aitken, who will attend to debts.

The Falksley Co., electrical engineers, 13a, Derby Road, Nottingham.—Messrs. F. V. Howitt and E. Copestake have dissolved partnership. Mr. Copestake is retiring and the business will be carried on by Mr. Howitt, under the same name and at the same address, and he will attend to debts.

Meetings of Creditors.

Unbreakable Lamps, Ltd.—A meeting of creditors was held on August 18th at the offices of Poppleton & Appleby, 3, Warwick Passage, Corporation Street, Birmingham.

Mossop's (London), Ltd.—A meeting of creditors was to be held yesterday (Thursday) at Winchester House, E.C.2.

Deed of Assignment.

C. L. Biggs & J. L. Smith, trading as Biggs & Smith, electrical engineers, &c., 143, High Street, Wanstead, Essex.—Particulars of claims to be sent to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, by August 29th.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Aug. 19th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£17	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... . per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£131	£2 inc.
	Grade II ... ... ,, ,,	£94	£1 inc.
	Grade III ... ... ,, ,,	£56	...
c	Brass (rolled metal 2" to 12" basis) per lb.	8¾d.	...
c	,, Tubes (solid drawn) ... ,,	10½d. to 10¾d.	...
c	,, Wire, basis ... ... ,,	8¾d.	...
c	Copper Tubes (solid drawn) ... ,,	11¼d.	...
g	,, Bars (best selected) ... per ton	£79	...
g	,, Sheet ... ... ,,	£79	...
g	,, Rod ... ... ,,	£79	...
d	,, (Electrolytic) Bars ... ,,	£52 2s. 6d.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£62 2s. 6d.	...
d	,, ,, H.C. Wire per lb.	8d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	6¾d.	¼d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton.	79/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£19 15s.	...
g	Mercury ... ... per bot.	£22 12s. 6d. to £22 16s.	...
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/1½d.	...
p	,, ,, drawn bars & rods ,,	1/1½d.	...
p	,, ,, rolled strip & sheet ,,	1/2½d.	...
p	,, ,, wire ... ... ,,	1/1½d.	...
o	Platinum ... ... per oz.	£7 10s.	15s. dec.
d	Silicium Bronze Wire ... ... per lb.	9½d.	,,
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£136 10s. to £137	£2 10s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Messrs. James Forster & Co., reporting on August 16th, stated that the lead market continued under the control of the Producers' Association, which was ready to lend support on any signs of weakness. During last week a fair demand was met with from consumers, while Russia was in the market for a moderate quantity. Arrivals were on the short side, but more lead is expected at the end of the month. The Board of Trade Returns for July show imports of 20,642 tons and exports of 9,376 tons, leaving 11,266 tons for home consumption.

For Sale.

Offers are invited for the purchase of electric ovens, radiators, and accessories and letters patent of the Wynsor Electric Range Co., Ltd., which is now in liquidation.

(See our advertisement pages to-day.)

Recent Contract.

Messrs. Mavor & Coulson, Ltd., Glasgow, have secured a contract from one of the largest colliery companies in America for coal cutters and conveyors. This is a repeat order secured in the face of keen American competition, and the United States import duty of 30 per cent. The original order was obtained by a director of the company while in the United States, which is testimony to the value of personal contact with foreign customers.

Reduction of Capital.

Thomas Mitchell & Sons, Ltd.—The Court of Chancery (Manchester District) has confirmed the reduction of this company's capital from £30,000 to £21,000.

Trade Announcements.

The General Chemical & Pharmaceutical Co., Ltd., is moving its administrative offices to "Judex Works," Sudbury, Middlesex, on August 27th (Telephone: Wembley 3883; telegrams: "Chemipharm, Wembley"). The Willesden factory will continue to operate for the present.

Messrs. Burke & Co., Ltd., electrical engineers and contractors, have removed to larger premises at 548, Chester Road, Old Trafford, Manchester. (Telephone: Trafford Park 1004).

The Foster Engineering Co., Ltd., has taken larger premises at Liverpool, the new address of which is 7, Seabrow (off James Street), Liverpool. The telephone number remains the same, *viz.*, Bank 3768.

Lighting and Power Notes.

Accrington.—Proposed Augmented Supply to Works.—Negotiations are taking place between the Electricity Committee and Messrs. F. Steiner & Co., of Church, respecting proposals for giving an increased supply of electricity to the latter's Church works and to Aspin Colliery for pumping purposes. The erection of two new sub-stations will be involved if these proposals are carried out.

Australia.—Ballarat's Electricity Supply.—A sub-committee appointed by the Ballarat City Council to inquire into the question of the electricity supply has recommended the Council to ask the State Electricity Commission to intimate the total cost of purchasing the whole of the undertaking in Ballarat, the cost of constructing overhead lines from either Melbourne or Geelong (whichever is decided upon) and the cost of reconditioning the tramcars and tramway tracks in Ballarat.

The Bunnerong Power Station.—As the demand for electricity has not increased at the anticipated rate, the City Commissioners have approved a recommendation of the Electricity Committee to delay the completion of the Bunnerong power station for one year.

Bacup.—Extensions.—The Town Council has sanctioned the laying of underground cables in various parts of the borough, at a cost of £9,529 and the purchase of transformers and plant, at an estimated cost of £4,000.

Barnstaple.—Year's Working.—An abstract of the accounts of the Corporation electricity undertaking for the past year states that the total sales of electricity amounted to 800,635 kWh, as compared with 766,445 kWh in 1929. In the past two years very considerable improvements have been effected by the replacement of mains and machinery. Since the inauguration of the works in 1902 a total loan of £112,542 has been raised on electric lighting account, of which some £44,749 has been paid off.

Bath.—Year's Working.—The accounts of the Corporation Electricity Department (engineer: Mr. J. W. Spark) for the twelve months ended March 31st last state that there was an increase from £97,234 to £108,576 in the total income of the undertaking. Working expenses amounted to £53,829, as compared with £45,011 in the previous year, while the gross profit was £54,747 (£52,223). After deducting loan charges, depreciation, &c., there was a net surplus of £11,364, as compared with £8,713 in 1928-29. The net expenditure upon capital account during the year was £30,246, bringing the total now spent on the undertaking up to £647,694. The electricity sold for all purposes showed a substantial increase from 12,556,735 to 17,154,312 kWh and the total maximum supply demanded from 6,450 to 8,200 kW.

Bolivia.—HYDRO-ELECTRICAL DEVELOPMENT.—Application has been made to the Bolivian Government by a civil engineer for a concession to supply hydro-electric power by employing the outlet of Lake Titicaca and the Rio Desaguadero. The applicant proposes to divert the river's course towards the Pacific instead of, as at present, to the Atlantic, thus providing in the comparatively short distance from the lake to the Pacific coast a fall of 3,700 metres. The project would necessitate the construction of a tunnel 25 km. long through the Cordilleras, the cost of which is estimated at $250,000,000 (£50,000,000). This, according to the engineer, could be subscribed by the several countries of South America benefitting from the scheme. A further suggestion put forward is that the extra flow of water to the Pacific coast would make possible the irrigation of many thousands of square kilometres of land now lying barren.—*Reuter's Trade Service* (La Paz).

Bredbury and Romiley.—HIRE-PURCHASE SCHEME.—The Urban District Council has applied for sanction to a loan of £3,000 for electrical equipment to be supplied on the hire-purchase system.

Canada. — HYDRO-ELECTRICAL DEVELOPMENT. — A contract amounting to $20,000,000 for power development at Abitibi Canyon, north of Cochrane, Ontario, has been awarded to the Dominion Construction Company. *The Times* says that the installation, which is designed for 250,000 h.p., will be begun immediately and is expected to be completed by 1932.

POWER DEVELOPMENT SCHEMES.—The power projects now under development in Canada will necessitate the expenditure of more than $100,000,000 a year during each of the next three years. The total installation now amounts to over 5,700,000 h.p. and additional installations of over 3,000,000 h.p. will be made within the next five years. On the Pacific coast large resources are available, and the St. Lawrence River is capable of a further development of over 2,000,000 h.p. The outstanding undertaking in Ontario is that at Abitibi Canyon, 120 miles north of Iroquois Falls, where 270,000 h.p. will be developed at a cost of approximately $25,000,000. The Ontario Hydro-Electric Power Commission has already nearly completed its programme for the season's work of extending its transmission line into the rural districts. It is planned to build 1,434 miles of rural line to serve more than 8,500 rural customers. The cost of the 1930 programme is estimated at $3,250,000.

Clacton-on-Sea.—LOANS.—The Urban District Council has applied for sanction to loans of £8,500 for mains and services, £2,000 for meters, £500 for re-laying mains, and £1,000 for domestic apparatus.

Colchester.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the following loans: Measuring and recording instruments at Hythe generating station, £1,140; completion of electricity outer ring main for the borough, £19,500; overhead lines, £4,000.

Continental.—SWEDEN.—A report of the Vattenfallsstyrelsen (Waterfalls Board), the Government Department entrusted with the management of the Government-owned water-power resources and hydro-electric plants, records a gross profit in 1929 of Kr. 30,400,000, of which Kr. 27,900,000 related to power resources. As the running costs were Kr. 14,200,000, there was a net profit of Kr. 16,200,000, representing a return of 5 per cent. on the capital invested. The total production of power at the Government-owned works in 1929 was 1,700,000,000 kWh, as against 1,580,000,000 in 1928. The consumption by electric railways rose from 135,000,000 kWh to 165,000,000 kWh, while the large industries, such as the paper, pulp, and mining industries, consumed 445,000,000 kWh as compared with 360,000,000 kWh. Electric power is being used by farmers to a growing extent, the consumption in 1929 being 38,400,000 kWh, as compared with 34,300,000 kWh in 1928.—*Reuter's Trade Service* (Stockholm).

GERMANY.—The output of the 122 principal electric power stations in Germany during the four months ended April last amounted to approximately 5,660,000,000 kWh, as compared with 5,331,600,000 kWh in the corresponding period last year.

CZECHO-SLOVAKIA.—According to a recent report the Czecho-Slovakian Government's expenditure in connection with river-regulation and water-power development during 1929 amounted to approximately £720,100. During the year considerable progress was made in the regulation of the Rivers Elbe (Labe) and Moldau (Vltava), while the construction of a dam on the Vltava at the hydro-electric station in Mirejovice, Bohemia, and the construction of a central power station at Starohorsky Potok, in Slovakia, were completed. In addition, work was continued on the hydro-electric power plants on the Vltava at Kolin and on the Uz River at Uzhorod, the capital of Russinia.

Dewsbury.—YEAR'S WORKING.—Although the textile trade stagnation has meant a considerable falling away in the industrial load, the rapid development of domestic consumption has caused an increase of 9½ per cent. in the total amount of electrical energy sold, according to the draft accounts of the borough electricity undertaking for the year ended March 31st last, issued last week. The gross profit was £11,244 and the net profit £2,051.

Dumfries.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee recommends that sanction be obtained to the borrowing of £2,500 for a scheme of assisted wiring.

Great Yarmouth.—YEAR'S WORKING.—The annual accounts of the Corporation Electricity Department (engineer and general manager: Mr. P. G. Campling) for the year ended March 31st last show an increase in total revenue from £92,387 to £107,354. The gross profit also rose from £59,499 to £66,332, the total working expenditure being £41,022, as compared with £32,888 in the preceding year. To the gross profit was added income from other sources making a total of £71,631 available. From this had to be paid loan interest (£22,842), sinking fund contribution (£28,579) and sundry other items charged to revenue. There was a net surplus of £7,008, which compares with £6,066 in 1928-29. The net capital expenditure during the year amounted to £45,833, bringing the total now spent on the undertaking to £725,927. Electrical energy sold totalled 12,503,558 kWh, as compared with 8,546,276 kWh in the previous year, the maximum supply demanded rising from 5,730 to 6,450 kW.

Hastings.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. J. Ryan) for the twelve months ended March 31st last show a decrease in the total revenue from £121,854 to £117,725. Working expenses were £61,915, as compared with £52,713 in the preceding year, the gross profit falling from £69,141 to £55,810. After making provision for capital and other charges there was a net surplus of £3,014 as against £24,092 in 1928-29. The capital expended during the year amounted to £76,667, of which £44,096 was spent on mains. The electrical energy sold increased from 13,828,042 to 15,655,172 kWh, but the maximum supply demanded fell from 8,550 to 8,350 kW. The average price obtained per kWh was 1.63d., as compared with 1.965d. During the year supplies were made available to consumers in Sedlescombe, Northiam, Beckley and Westfield. Improvements were also made in the public lighting of the promenade as well as in several other thoroughfares, 121 additional lamps being put into service.

Holmes Chapel.—PROPOSED ELECTRICITY SUPPLY.—The Rural District Council has consented to the application for an Order by the Mid-Cheshire Electricity Supply Co., Ltd., for the supply of electricity to Goostrey, Blackden, Twemlow, Church Hulme, Cotton, Cranage, and Leese. The company has informed the Council that it is now in a position to supply electricity to Holmes Chapel if conditions are favourable.

Hornsey.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains in Twyford Avenue (£1,816), Church Vale (£800) and Muswell Hill Road (£538).

Japan.—ELECTRICAL DEVELOPMENTS.—A 10,000-kW steam power plant is to be installed at the Mayeda power station of the Toho Power Co. The development of 10,000 kW on the Kuma River is also contemplated by the Kumamoto Electric Co.

Liverpool.—EXTENSIONS.—Extensions to mains are to be carried out by the Corporation Electric Power and Lighting Committee in several parts of the city. It is intended to lay a main from Sefton Road to Gorsey Lane, Ford, and to the proposed sub-station in Sterrix Lane at an estimated cost of £4,332. A sub-station is to be provided and equipped in Eaton Road where extensions to mains are about to be made at an estimated cost of £6,492. E.h.p. cables are to be laid from the Pumpfields sub-station to Bibby's sub-station in Great Howard Street, the cost being £3,416. The cost of running the cable from the Clarence Dock power station to Pumpfields is estimated at £15,500. Authority has been granted for the extension of h.p. mains to the new Stanley abattoir, £2,066; l.p. mains, £807; and sub-station equipment, £1,500.

London.—ST. PANCRAS.—*Year's Working.*—The Borough Council's electricity undertaking (engineer: Mr. J. T. Baron) showed a total revenue of £289,787 for the year ended March 31st last, as compared with £292,677 in 1928-29. Working expenses increased from £124,470 to £133,205, and there was a gross profit of £156,582 (£168,207). After providing for loan repayments (£70,846), loan interest (£44,050), income tax (£13,344) and sundry other items charged to revenue, there was a net surplus of £25,586, which compares with £40,584 in the preceding year. The capital expenditure during the year amounted to £131,414 and included £32,969 for mains and £67,365 for machinery. The total capital expenditure at the end of the year was £1,585,494. The electrical energy sold increased from 36,749,593 to 41,183,316 kWh and the maximum supply demanded from 22,400 to 23,300 kW. The average price obtained was 1.60d. per kWh, as compared with 1.83d. in the preceding year.

Nelson.—YEAR'S WORKING.—The annual report on the working of the Corporation Electricity Department (engineer: Mr. G. F. Nayler) for the year ended March 31st last shows a total revenue of £81,589, a working expenditure of £51,117 and a gross profit of £30,472. After deducting capital and other charges there was a net surplus of £7,387, as compared with £4,638 in 1928-29. The electrical energy sold increased from 9,905,894 to 10,515,158 kWh and the maximum supply demanded from 4,600 to 4,720 kW. The average price obtained per kWh rose from 1.40d. to 1.44d. During the year supplies were made available to consumers in Barnoldswick and Earby. A scheme of assisted wiring is now under consideration.

Newport Pagnell.—Electricity Supply Anticipated.—The Rural District Council has decided to have the whole of the houses it is erecting wired for electric lighting in anticipation of a supply of energy being available in the near future.

Northern Ireland.—Dromore, Co. Tyrone.—The Town Council is seeking powers to carry out an electric lighting scheme.

Oswestry.—Proposed Extension of Supply Area.—The Town Council is contemplating making application to the Electricity Commissioners for a Special Order to extend its area of supply to include so much of the rural district of Oswestry as is not already included, the parishes of Kinnerley, Knockin, Llanyblodwel, Llanymynech, Ruyton of the Eleven Towns and West Felton, and parts of the parishes of Selattyn, Oswestry Rural and Whittington.

Rawtenstall.—Year's Working.—The accounts of the Corporation Electricity Department (engineer: Mr. C. L. E. Stewart) for the twelve months ended March 31st last record a total revenue of £60,063, a working expenditure of £30,249, and a gross profit of £29,814. The figures for the preceding year were: Income, £61,662; working expenses, £31,879; gross profit, £29,783. After deducting capital and other charges there was a net surplus of £5,221, as compared with £5,555 in the preceding year. The capital expenditure during the year amounted to £6,204, bringing the total now spent on the undertaking to £302,167. Sales of electrical energy increased from 13,449,971 to 14,173,358 kWh, but the average price obtained per kWh fell from 1.054d. to 0.996d.

Rochdale.—Electric Lighting of Council Estates.—The Corporation Housing Committee is to install electric lighting in 216 houses on Council estates.

Rotherham.—New Cables.—The Corporation Electricity Committee has been authorised to proceed with the laying of a h.p. cable from the works at Rotherham to Swinton, at an estimated cost of £7,883.

Salford.—Loans.—The Corporation Electricity Committee recommends that application be made for sanction to loans of £50,000 in connection with the change-over to a.c. and the standardisation of voltage, and £7,550 to cover the cost of extending the e.h.p. switchgear at the Agecroft power station and the provision of switchgear.

South-East Lancashire Electricity Advisory Board.—Bulk Supply.—The Electricity Commissioners have approved the contract for a bulk supply of electricity from the Trent Valley and High Peak Electricity Co. to New Mills Urban District Council.

Special Order.—Sanction has also been received from the Electricity Commissioners to an application of the Lancashire Electric Power Co. for a Special Order to supply electricity in parts of the Wigan rural district, including the parishes of Dalton, Parbold and part of the parish of Wrightington.

Operating Statistics.—For the year ended March 31st last the total energy delivered to the feeders was 1,077,833,077 kWh, as compared with 1,003,036,775 kWh for the preceding year. The cost per kWh was 0.2361d. as against 0.244d.

Working Arrangement.—The Engineering Advisory Committee has recommended the Board to approve a proposed working arrangement between the Stretford and District Electricity Board and the Irlam Urban District Council.

The Warrington Extension Order.—Having considered the representations made by all constituent authorities interested in the proposed extensions in the Warrington area, the Committee has recommended that (*a*) the Manchester Corporation is the appropriate undertaker to take out a Special Order for Carrington and Partington; (*b*) the Altrincham and Durham Massey areas shall not be included in any Special Order for the present; and (*c*) the Lancashire Electric Power Co. is the appropriate undertaker to develop the parish of Rixton-with-Glazebrook.

Fringe Order.—The Committee has recommended the Board to approve a fringe order applied for by the Cheadle and Gatley Urban District Council to supply Moss Farm, Handforth.

The above minutes of the Engineering Advisory Committee have been approved by the Board.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising (*a*) the transfer to the Porthcawl Electricity Co., Ltd., of the Porthcawl electricity undertaking, and (*b*) the Portsmouth Corporation to supply electricity in the parish of Hambledon in the rural district of Droxford.

Strood.—Mains Extensions.—The Kent Electric Power Co., has notified the Rural District Council of its intention to extend its mains from Strood to Cliffe Village.

Supply to Ifield.—The Council has consented to an application by the Gravesend Corporation for an Order to supply electricity to Ifield.

Tunbridge Wells.—Year's Working.—A statement of the financial returns of the Corporation Electricity Department (engineer: Mr. R. N. Torpy) for the year ended March 31st last says that the total revenue from the undertaking amounted to £81,309; the working expenditure totalled £39,972, leaving a gross profit of £41,336. The previous year's figures were: Income, £77,980; working expenses, £33,643; gross profit, £44,287. After providing for capital charges there was a net surplus of £12,526, as compared with £17,450 in the preceding year, the decrease being attributable to an increase of rates payable by the undertaking and to various tariff reductions. The capital expenditure during the year amounted to £28,090, the bulk of which was spent on mains and services. The sales of electricity rose from 10,477,059 to 12,110,921 kWh, and the maximum supply demanded from 5,600 to 5,950 kW.

New Switchgear.—The Town Council has applied for sanction to a loan of £15,150 for e.h.p. switchgear and alterations to the existing switchgear.

Tariff Alterations.—The Council has made the following alterations in the tariffs for electricity. The flat rate for heating and power is to be reduced from 1d. to ¾d. per kWh. The "unit" charge for private houses and offices on the two-part tariff which are electrified throughout and have no other form of heating, is reduced to ½d. per kWh. Slot meters are to be provided for workmen's dwellings and small property, and the charge for lighting is to be 1d. above the ordinary flat rate, and for heating and cooking ¼d. per kWh above. Hire-purchase wiring is to be paid for through slot meters, and limited to from four to eight points per house. The charge for electricity is to be 2d. per kWh above the ordinary slot meter rate. The borough electrical engineer is to present a report on the charges for the supply of electricity to business premises.

Turton.—Hire-purchase Scheme.—The Urban District Council has approved a hire-purchase scheme for cookers and other electrical appliances in place of the present hiring schemes.

Supply Extensions Contemplated.—The Council is considering the question of giving a supply of electricity to the Higher Bradshaw district.

Walsall.—Year's Working.—We have received from Mr. H. A. Howie, borough electrical engineer and manager, a copy of his report together with the statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £123,189, as compared with £119,247 in the preceding year, while working expenses totalled £80,719, as against £68,937, leaving a gross profit of £42,469 (£50,310). After providing for capital and other charges, there was a net surplus of £13,654 as compared with £18,522 in 1928-29. During the year the capital expended amounted to £41,979, the principal item being £32,803 for mains and services. The total now spent on the undertaking stands at £422,508. Sales of electricity increased from 18,061,848 to 19,796,707 kWh, but the maximum supply demanded fell from 7,730 to 6,953 kW. The average price obtained per kWh fell from 1.58d. to 1.49d. A reduction in the charges for electricity was in operation during the latter half of the year. A feature of the year was the increase in the popularity of the electric fire, no fewer than 422 being installed during the year.

Reduction in Bulk Supply Charges.—The Corporation Electricity Committee has received notice from the West Midlands Joint Electricity Authority of its intention to reduce the charges for bulk supplies during the year ending March 31st, 1931, to £3 10s. 6d. per kW of maximum demand and 0.195d. per kWh, subject to variation in accordance with the cost of fuel. Compared with £3 13s. and 0.2d. for last year, this represents a saving of approximately £1,300.

Walton-on-Thames.—Loan.—The Urban District Council has applied for sanction to a loan of £5,000 for mains and services. The Council also proposes to expend from revenue £1,000 for meters and £1,500 for cookers and domestic appliances.

Warrington.—Assisted Wiring Scheme.—The borough electrical engineer has prepared a scheme of assisted wiring.

West Ham.—Electricity Department's Progress.—In his annual report, Mr. J. W. J. Townley, engineer and manager of the Corporation Electricity Department, states that there was an increase during the year of 2,453 in the number of consumers connected, bringing the total to 15,850. The popularity of the rental wiring scheme continued; the total number of these installations completed was 1,822 making a total of 6,090 at the end of the year. There was a steady increase in the use of domestic appliances.

Whitby.—Loans.—The Urban District Council has decided to make application for sanction to loans of £2,000 for the assisted wiring scheme and domestic appliances, and £2,000 for mains and services.

Winchester.—Extensions.—The Corporation Electricity Committee has agreed to supply electricity to 132 houses to be erected in the Midland Road, subject to the Housing Committee undertaking to guarantee for a period of ten years an annual return of not less than 20 per cent. of the capital cost of the cable.

Shop-window Lighting.—The Town Council has fixed the charge for electricity for late shop-window lighting at 2½d. per kWh.

Witney.—Change-over Scheme.—The Urban District Council has agreed to a scheme costing £7,500 for the change-over of the system of electricity supply from d.c. to a.c. in the southern part of the town.

Tramway and Railway Notes.

Continental.—SWITZERLAND.—The possibility of a mountain-railway to the top of the Bernina is under consideration. The terminus would be situated at an altitude higher than that of the Gornergrat, and of the Jungfraujoch.

FRANCE.—The work of electrification has now been completed on the Toulouse-Ax-les-Thermes section of the Midi Railway.

Japan.—PROPOSED ELECTRIC RAILWAY.—The construction of an electric railway at Amagasaki is under consideration.

Leamington.—TRAMWAY ABANDONED.—The last tram ran between Leamington and Warwick on Saturday last.

Liverpool.—EXTENSION OF TIME.—The Minister of Transport has extended the time limited for the completion of the tramways authorised by the Liverpool Corporation Light Railways Order, 1923, until October 31st, 1931.

Lytham St. Anne's.—YEAR'S WORKING.—The Corporation tramways undertaking showed a net loss of £6,712 last year. The traffic receipts were £43,910, as against £49,734 in the previous year; £12,911 was for through running expenses on the Blackpool Corporation lines. On the Lytham St. Anne's lines traffic receipts were £30,633, as against £35,083. The total expenses amounted to £39,304, as compared with £41,720. There was a gross profit of £4,605, but after providing for sinking fund and interest (£11,318) there remained a net deficit of £6,712.

Siam.—DIESEL LOCOMOTIVES.—The Siamese Railway Ministry last year announced its decision to electrify the railway in the vicinity of Bangkok. The scheme seems, however, to have been modified in favour of Diesel locomotive traction, orders having recently been placed on the Continent for a number of Diesel locomotives.

Sunderland.—YEAR'S WORKING.—We have received from Mr. Charles A. Hopkins, general manager and engineer of the Corporation Tramways and Motors Department, a copy of his report for the financial year ended March 31st last. The total revenue obtained from the tramways amounted to £128,819, while the working expenditure was £105,873, leaving a gross profit of £22,947. After providing for interest on capital (£2,914), income tax (£1,793), and bank interest (£98), there was a balance of £18,272, which was allocated as follows:—Repayment of loans, £10,241; renewals fund, £7,781; other items, £250. Repairs to and reconstruction of track cost £21,670. The number of passengers carried increased from 29,337,273 to 30,813,966 and the car miles run from 1,628,715 to 1,722,827.

Tynemouth.—TRAMWAY ABANDONMENT.—Negotiations are taking place between the Town Council and the Tramway Company with regard to the abandonment of the tramways.

Wallasey.—YEAR'S WORKING.—We have received from Mr. H. H. Lincoln, general manager of the Corporation Tramways Department, a copy of the abstract of the accounts of the undertaking for the year ended March 31st last. The total revenue amounted to £68,240 and the working expenses were £53,415, leaving a gross profit of £14,825. The corresponding figures for last year were: Income, £105,242; working expenses, £80,193; gross profit, £25,049. After providing for capital and other charges there was a net surplus of £955, as compared with £9,114 in the preceding year. The net surplus on the 'bus undertaking amounted to £24,047 (£11,802). The number of passengers carried by the trams decreased from 17,981,159 to 12,142,667, and the care mileage from 1,309,014 to 931,355. The average receipts per car mile fell from 18.96d. to 17.25d.

PROPOSED RAILWAY ELECTRIFICATION.—The Corporation Parliamentary Committee has adopted a resolution voicing the opinion that, if the electrification of the Seacombe Railway is to be undertaken, the railway line from Bidston Station to Seacombe Station should be included in the scheme. The town clerk is to make further inquiries and report to a sub-committee.

Telegraph and Telephone Notes.

Australia.—TELEGRAPHY.—A return made available by the director of postal services (Mr. H. P. Brown) shows that Australia sends 2.8 telegrams per head of population per year. New Zealand occupies first place with 4.7 telegrams per head. Next to Australia comes the United States, with 1.9 telegrams per head per year. The figures for Britain are only 1.2. France sends 0.9 and Germany 0.5. Of the Australian States, Western Australia sends 4.7 telegrams per head, equalling the proportion of New Zealand; Queensland sends 3.15; South Australia, 2.7; New South Wales, 2.55; Victoria, 2.45; and Tasmania, 2.3.

Bulgaria.—RURAL TELEPHONY.—The General Council of Sofia has assigned a sum of 750,000 leva for the organisation of telephone communication between 42 villages in its districts. The communes interested will supply the necessary posts and the technical work will be in charge of the Ministry of Posts, Telegraphs, and Telephones. The 750,000 leva mentioned is for the purchase of apparatus and wire. The total length of the new lines will be 230 kilometres.—*Reuter's Trade Service* (Sofia).

Community Telephones.—STREET ALARM BELL.—A novel communal telephone experiment may be made in the little Derbyshire village of Peak Forest. The telephone service has been extended to the village recently and a kiosk for public use has been erected in the village street. The kiosk is available as usual for outward calls, but, following a suggestion by a resident, negotiations are going on with the Post Office with a view to making it available for inward calls also. The proposal is to place a large alarm gong on the side of the village school-house, instead of the usual telephone bell, to announce a call from the outer world. It would be answered by a villager, who would either call the person wanted to the kiosk, or deliver a message for him.

Jugo-Slavia.—AUTOMATIC TELEPHONY.—The Government is reported to have placed an order with German Siemens and Halske Co. for the modernisation of the Belgrade telephone network on the automatic system.

United States.—TELEPHONE EXPENDITURE.—The construction expenditure of the Bell telephone system of America for the coming five years will be considerably in excess of £420,000,000. The amount allocated for the present year is £140,000,000, more than 13 times the sum to be spent this year on British telephone development, which will total £10,500,000. Notwithstanding the high telephone development of the United States, with its 163 telephones per 1,000 of population, as compared with Great Britain's 38 telephones per 1,000, the Bell system is confidently continuing its policy of spending more than £500,000 a year, one per cent. of its annual turnover, on "selling" the service by means of advertising, leaflets, and other forms of propaganda.

Radio Notes.

Accumulators.—ILFORD REGULATION.—Owing to the damage caused by spilt acid, the municipal authorities of Ilford, London, have lately issued a regulation prohibiting passengers from taking wireless accumulators into electric tramcars.

Canada.—LICENCES.—On July 1st, 1930, there were 423,557 receiving licences in use, some 107,589 more than in the previous year. Ontario leads with 211,775, and Quebec is second with 71,757; British Columbia third with 35,995; Saskatchewan follows with 32,906, and there are 9,528 in Ottawa; 61,683 in Toronto; 43,054 in Montreal; 15,084 in Winnipeg; 711 in Hull; 968 in Cornwall; 929 in North Bay; 615 in Smith's Falls; and 389 in Sudbury.

Community Reception.—ACCRINGTON.—The Town Council recently considered the control of overhead wires proposed to be erected for a community broadcast reception scheme. A clause in the suggested agreement fixed a wayleave rental of 7s. 6d. per annum for each wire erected over a public highway, but Councillor Baron did not see why such a charge should be imposed, as the wires would not touch Corporation property and the Corporation was insured against damage. The wires would cross the streets in the air; the people who would use the system would be the poorer section, and he did not think the Corporation ought to put the charge upon them. Alderman Waddington replied that if they struck out the clause they might as well scrap the lot; similar charges were made in adjacent towns and all the streets in Accrington were Corporation property. On a vote being taken, three only were for the amendment to delete the clause; the conditions were approved.

France.—COLONIAL SERVICE.—A Commission of 18 members has been appointed for four years to advise the Colonial Ministry technically. At its first meeting on July 18th, says *World-Radio*, it unanimously recommended the establishment of a temporary station in the grounds of the Colonial Exhibition that is to be held at Vincennes next year, to be used for transmissions to the colonies, and to be followed later by the erection of a permanent station in the neighbourhood of Paris.

Germany.—LICENCES.—On July 1st, 1930, the number of receiving licences issued had reached 3,224,944, representing a decrease of 13,452 as compared with the April 1st figure and an increase of 398,316 in comparison with the July 1st, 1929, total. According to *World-Radio*, there are now 50.3 owners of wireless sets per 1,000 inhabitants.

Radio Interference.—GRAMOPHONE RECORD.—A gramophone record (Odeon A.208053b) recorded by the Basle Wireless Club, Switzerland, amply illustrates the various types of electrical interference which can mar radio reception. A commentary on the various forms of interference is included on the disk, which should prove to be of valuable assistance in the research work now being carried on by various bodies in an endeavour to eliminate interference.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—September 30th. National Sanitation Works Department. Four electric centrifugal pumping sets direct coupled to 3-phase motors, 220 V, 50 cycles; twelve electric pumping sets (deep well type); seven 3-phase oil-immersed transformers; 4,000 metres of underground cables, &c. (A.X. 10035.)*

Ashbourne.—September 20th. Urban District Council. A transformer kiosk and equipment; also e.h.p. and l.p. cables and roadwork. (See this issue.)

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 23rd. Rectifiers and charging resistances. (A.X. 9968.)*

September 2nd. Underground and aerial cable. (A.X. 10042.)*

September 30th. Switchboard, instruments, and test plugs and sleeves. (A.X. 9937.)*

Transmitters and associated parts. (A.X. 10077.)*

October 14th. Condensers. (A.X. 10000.)*

BRISBANE.—September 29th. City Electric Light Co., Ltd. 550-kVA, 5,000 to 415-240-V outdoor-type transformers. Specifications (£2 2s. first copy, 10s. 6d. each additional copy) from J. T. Ryan, secretary to the company, Boundary Street, Brisbane. (A.X. 10043.)*

SYDNEY.—September 8th. Municipal Council. Automatic reclosing equipment for h.p. feeder switches. Specifications from the construction engineer, Electricity Department (deposit £1). Tenders to W. G. Layton, town clerk.

September 15th. H.p. pilot cables. (A.X. 10079.)*

September 29th. 33,000-V cable. (A.X. 10078.)*

Bury.—September 3rd. Electricity Department. 6,600-V 3-phase ironclad switchgear. (August 15th.)

Cardiff.—September 8th. Electricity Department. Electric locomotive. (See this issue.)

Cheadle and Gatley.—September 5th. Electricity Department. 6,600-V switch unit and ring main insulators. (August 15th.)

Ealing.—September 8th. Electricity Supply Department. 33,000-V 3-phase main, transformers, automatic induction regulators, and switchgear. (August 15th.)

East Grinstead.—August 26th. Urban District Council. E.h.p. feeder and l.p. distributors. (August 15th.)

Edinburgh.—August 23rd. Corporation. Electrical installation at Corstorphine and Belle Vue Schools. Specifications from W. F. Mitchell, consulting electrical engineer, 34, St. Andrew Square. Tenders to Town Clerk.

August 30th. Corporation. Heating plant at new school, Prestonfield, and electric lighting installation at new Craighall School. Schedules from E. J. MacRae, city architect. Tenders to town clerk.

Egypt.—CAIRO.—Ministry of the Interior. September 30th. Electric motors, pumps, &c., at the Dessouk waterworks. (A.X. 9935.)*

Egyptian State Railways.—October 2nd. 100-ton electrically-driven shallow-type locomotive traverser.

Erith.—August 25th. Electricity Department. H.p. switchgear and sub-station equipment. (August 8th.)

Glasgow.—August 25th. Corporation. Poles, bases, cable, electric lanterns, and extension pieces for street lighting. Specifications from office of Inspector of Lighting, 20, Trongate. Offers to Town Clerk.

Holywood.—September 1st. Electricity Department. L.p. overhead lines and underground cables, a transformer kiosk and a transformer. (August 15th.)

Hull.—September 18th. Electricity Department. Cooling tower pump and accessories. (August 8th.)

Corporation Telephone Committee. Private automatic telephone switchboard. (August 8th.)

India.—Indian Store Department. September 29th. Supply of 75-kW oil engine generating sets, &c., for Landikotal power station. (A.X. 10040.)*

September 4th. Transformers, switchgear and cable work. (A.X. 10095.)*

London.—ISLINGTON.—September 10th. Borough Council. Switchgear for sub-stations. (July 25th.)

September 2nd. Cleansing Committee. Battery for driving refuse-collecting vehicle. (August 1st.)

LONDON COUNTY COUNCIL.—September 15th. Water-tube boilers with stokers, superheaters, economisers, ash conveying plant, switchgear, &c. (August 15th.)

September 15th. Wiring and fittings at the Whitechapel Fire Station. (See this issue.)

BETHNAL GREEN.—September 1st. Borough Council. Electric lighting installation work at several blocks of tenement dwellings. (August 8th.)

Lourenco Marques.—October 17th. Board of Ports and Railways. Automatic signalling system on the Ressano Garcia line. (A.X. 9971.)*

Manchester.—August 29th. Public Assistance Committee. Electrically-driven refrigerator at Tame Street Institution, Ancoats. Specification from Superintendent of Works, Public Health Department, Public Assistance Offices, All Saints.

Marlborough.—September 25th. Electricity Department. Extension of 11-kV, 3-phase overhead lines to Savernake Hospital. (See this issue.)

Newbury.—September 1st. Corporation. Two electrically-driven bore-hole pumps, together with boosters, switchgear, transformers, &c. (August 8th.)

New Zealand.—INVERCARGILL.—September 8th. City Council. Paper-insulated 3-core cable. (A.X. 9947.)*

WELLINGTON.—November 18th. Public Works Department. 110,000-V switchgear and steelwork for Waitaki power scheme. (A.X. 10022.)*

September 10th. Post and Telegraph Department. Dry cells. (A.X. 10093.)*

September 18th. Ebonite earpieces. (A.X. 10096.)*

DUNEDIN.—September 3rd. Corporation. Distribution transformers. (A.X. 10094.)*

Rochdale.—September 1st. Town Council. Electric lighting and power installations in 216 houses, Clover Hall and Nook estates. Particulars from Borough Surveyor, Town Hall.

Roscommon.—August 29th. County Council. Electrical installation at County Buildings. Specification (deposit £2 2s.) from J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin. Tenders to P. J. Gillooly, secretary, Courthouse, Roscommon.

Salford.—August 25th. Electricity Department. Annual supply of 6,600/400-V three-phase transformers. (August 8th.)

South Africa.—CAPE TOWN.—August 27th. City Electricity Department. Electric motors and starters. (A.X. 9966.)*

JOHANNESBURG.—August 28th. City Council. Transformers. (A.X. 10003.)*

September 29th. Railways and Harbours Administration. Two 4-ton electric portal cranes. (A.X. 10041.)*

Stoke-on-Trent.—August 29th. City Council. Installation of electric lighting in new hospital pavilion at the London Road Institution, Newcastle, Staffs. (August 8th.)

Turkey.—ANKARA (ANGORA).—September 16th. Posts, Telegraphs, and Telephones Department. Telegraph wire. (A.X. 10075.)*

Turton.—August 28th. Electricity Department. L.p. cables, distribution pillar, kiosk and transformer, &c. (August 8th.)

September 15th. Electricity Department. E.h.p. overhead and underground mains, switchgear, kiosks, &c. (August 15th.)

Warrington.—September 1st. Electricity Department. Twelve months' supply of e.h.p. and l.p. cables, earthenware conduits, concrete slabs and tiles. (August 15th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Australia.—SYDNEY.—Harbour Trust. Accepted :—
Wires and cables (annual contract).—Enfield Cable Works (Australasia), Ltd.
Electrical materials (annual contract).—Edison Swan Electrical Co., Ltd.; Enfield Cable Works, Ltd.; Noyes Bros. (Sydney), Ltd.; Reg. Rose & Co.; W. G. Watson and Co., Ltd.; Siemens Aust. Pty., Ltd.; Lawrence and Hanson Electrical Co., Ltd.; Australian General Electric Co., Ltd.; British General Electric Co., Ltd.
WESTERN AUSTRALIA.—Government Tender Board. Accepted : Control panels, link board panels and switchgear (£2,226). —Metropolitan-Vickers (Aust.) Pty., Ltd.
VICTORIA.—State Electricity Commission. Accepted :— 6,600-V metal-clad switchgear and accessories (£3,054); 2,200-V metal-clad switchgear and accessories (£14,724).—Metropolitan-Vickers Electrical Co., Ltd. —*Tenders.*

Dewsbury.—Town Council. Accepted :—
Kiosk (£207).—Yorkshire Transformer Co.

Durham.—County Education Committee. Accepted :—
Electric lighting installation at Houghton-le-Spring school (£203) and Whitburn Council school (£253).—F. Reid, Ferens & Co.

Egypt.—CAIRO.—*Reuter's Trade Service* reports that the Public Works Department has received eleven English and Continental offers for the North Delta pumping stations including the following :—
Metropolitan-Vickers Electrical Co., Ltd.—£E466,000.
Siemens-Orient.—£E476,000.
Ateliers de Constructions Electriques de Charleroi—£E662,000.
Société Générale de Constructions Electriques et Mécaniques, Paris.—£E800,000.
English Electric Co., Ltd.—£E839,000.
The quickest delivery (16 months) was offered by the Metropolitan-Vickers Electrical Co.

London.—G.P.O. Accepted :—
Special lamps for use in engineers' head lamps.—Siemens Electric Lamps & Supplies, Ltd.
SOUTHWARK.—Electricity Committee. Accepted :—
Battery boxes (£135), and plates (£134).—Alton Battery Co., Ltd.
Cables (£662).—Derby Cables, Ltd.
Meters (£61).—Measurement, Ltd.
Repairs to two rotaries (£132).—Collins Electrical, Ltd.

Malling.—Rural District Council. Accepted :—
Installation of electric light at the hospital and porter's lodge, and the supply of fittings, &c. (£134).—Drake and Fletcher.

Newport (Dundee).—Town Council. Accepted :—
Electrical installation in housing scheme (£80).—D. J. MacDonald, Ltd.

Stourbridge.—Higher Education Committee. Accepted :—
Installation of electric light at the Art and Technical Schools.—Page & Bloomer.

Tynemouth.—Electricity Committee. Accepted :—
Cable (£1,039).—Macintosh Cable Co., Ltd.

Forthcoming Events.

British Association.—Bristol. September 3rd to 10th. Annual meeting.
Union Internationale des Producteurs et Distributeurs d'Energie Electrique.—Brussels, September 5th to 14th. Third biennial congress.
Association of Public Lighting Engineers.—Leicester September 8th to 11th. Annual meeting and conference.
Institute of Metals.—Southampton. September 9th to 12th. Autumn meeting.
Iron and Steel Institute.—Prague, Czecho-Slovakia. September 15th to 20th. Autumn meeting.
Second British Glass Convention.—Buxton. September 17th to 20th.
Women's Engineering Society.—Oxford. September 19th to 21st. Eighth annual conference.
National Radio Exhibition.—Olympia. September 19th to 27th.
Municipal Tramways and Transport Association (Inc.).—Harrogate. September 24th to 26th. Annual conference.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

Three-heat switches up to 20 amperes and suitable for 600 volts.
COOKES GOLDSMITH patent triple vacuum stripper.
BUTTNER lamp resistances.
CHICAGO electric soldering iron.
Very small wicks for lubrication of fractional h.p. motors.

Notes.

Norwich Corporation Rural Area.

Negotiations have been proceeding between the Electricity Commissioners and Norwich Corporation in regard to the intensive electrification of a rural area adjacent to the city. The Corporation has agreed to develop 125 sq. miles on similar conditions to those arranged with Bedford Corporation in respect of 101 sq. miles in Bedfordshire, reported in the ELECTRICAL REVIEW of February 28th, 1930. The Norfolk rural area includes, *The Times* states, the parishes of Reepham, Cowston, Bowdeswell, North Elmham, Foulsham, and Saithorpe, the aggregate population of which is 14,166, as compared with 15,860 in the corresponding Bedford area.

The scheme of the Commissioners provides for the connection of every building in the area, except isolated cottages, without requiring the occupant to contribute towards the cost of connection or to guarantee a minimum consumption.

Relighting Miners' Lamps Below Ground.

M.D. Circular No. 44 recently issued by the Secretary for Mines reminds mine owners and managers that, under the provisions of the Coal Mines General Regulations (Safety Lamps), 1927, the practice (hitherto permissible) of unlocking safety lamps at the appointed lamp stations in any mine or part of a mine in which safety lamps are required by law to be used will be prohibited as from January 1st, 1931. The effect of the prohibition generally will be that flame safety lamps will either have to be fitted with electrical relighter pins to enable them to be relighted (without unlocking) by means of electric relighter machines at the appointed lamp stations, or, if they are not fitted with electrical relighter pins and have therefore to be opened in order to relight them, they will have to be sent out of the pit or to some other place where the use of open lights is permissible. The fitting of electrical relighter pins to safety lamps not originally provided with them is subject to the requirements of the Safety Lamps Orders, and, in order to ensure the continued safety of the lamps, it should be entrusted only to the approved manufacturers of the type of lamp in question.

Educational.

BOROUGH POLYTECHNIC, Borough Road, S.E.1.—Enrolment begins on September 15th for part-time day courses, evening and special courses in electrical engineering. Opening of new laboratories and workshop on September 23rd. Prospectus from the Principal. There will be a special course of ten lectures, commencing October 1st, by Mr. W. D. Owen, A.M.I.E.E., Electrical Research Association, on synthetic resins. Enrolment evenings, 7.0 to 9.0 p.m., September 15th, 17th and 19th. (See our advertisement pages to-day.)

Women's Engineering Society.

The eighth annual conference of the Society is to be held at Lady Margaret Hall, Oxford, on September 19th to 21st. Lady Moir, O.B.E., will deliver her presidential address at 8.15 p.m. on the first day.

Appointments Vacant.

Senior sales engineer for Messrs. Laurence Scott & Electromotors, Ltd.
A full-time head for the Electrical Engineering Department of the St. Helens Municipal Technical School.
Mains assistant for Winchester Electricity Department.
Assistant mechanical and electrical engineers for the Air Ministry.
Teacher at the Central Polytechnic, Croydon, for Croydon Education Committee.
Mains recorder and draughtsman for Newport Electricity Department.
Distribution engineer for East Suffolk Electricity Distribution Co., Ltd.
(See our advertisement pages to-day.)

The " Prestyn House," Plymouth.

The " Prestyn House " is one of the most interesting and also one of the three oldest buildings in Plymouth. Although generally in an excellent state of preservation, it is being completely restored by Mr. A. Southcombe Parker, F.R.I.B.A., hon. sec. of the Old Plymouth Society, for use as St. Andrew's war memorial. Originally built in the latter part of the 15th century by the Prior of Plympton, it was used as the lodging house of the priests who served St. Andrew's Abbey and also local Chantries. At the dissolution of the Monastery of Plympton in 1539 the building passed into private ownership, and it has only recently been restored to St. Andrew's Church for ecclesiastical purposes. The arrangement of the building resembles the plan of a Carthusian monastery, wherein each monk has his separate cell opening from an enclosed court. About six years ago a vaulted crypt was discovered under the northern end of the building, and in it were found several interesting relics of early days. The walls of the building are of great thickness and stability. During the progress of the restoration the " Prestyn House " was wired for electric light with the " Kalibond " wiring system, which was exclusively specified by Mr. A. Southcombe Parker, and the electrical work was carried out by Messrs. Brewer & Phillips. The wiring is concealed wherever possible, and all the lighting fittings are in keeping with the early character of the building.

A View in the " Prestyn House."

A Hydrogen-cooled Synchronous Condenser.

A hydrogen-cooled synchronous condenser is being installed by the Southern California Edison Company. This machine is stated by *Power* to be rated at 15,000 kVA, 11,500 volts, 3-phase, 50 cycles, 750 r.p.m.

Many advantages are claimed for the use of hydrogen cooling instead of air cooling. The output of the machine is increased by about 25 to 30 per cent. above that for operation in air; power losses are considerably lowered, especially at small loads; damage to insulation arising from static discharge is practically eliminated; fire hazards are reduced to a minimum, since hydrogen does not support combustion; and the machine will always be clean, inasmuch as it must necessarily have a closed system of ventilation.

The condenser will be operated out of doors, and the hydrogen will be water cooled, the coolers being within the machine. Collector rings and brushes are in a small chamber at one end of the machine and can be inspected through small glass windows; when the machine is shut down, this chamber may be removed without affecting the hydrogen within the condenser.

When filling the condenser with hydrogen, an inert scavenger gas is used to expel all the air; this operation insures against an explosive gas mixture at any time during that operation. After the condenser is filled with hydrogen, an explosion is impossible, even though there were some source of ignition. Nevertheless, the machine is made explosion proof. The pressure inside is maintained above atmosphere, so that even the negligible leakage of hydrogen will be outward. The gas is supplied from steel tanks which are provided with valves to reduce the pressure for admission into the machine. Instruments mounted on panel boards inform the operator of the pressure within, the percentage of hydrogen, and the temperature of the various parts. Numerous alarm signals are provided whereby the attendant is notified of any departure from normal conditions.

Standardised Wiring Accessories.

With reference to the article under the above heading in our issue of August 8th, p. 235, it is stated towards the end of the article that " all the standardised accessories are being sold under the common trade mark ' C.R. ' (cable research)." We are asked to state that this is likely to give a wrong impression, and that the only Cable Research Committee trade mark is the " Dove " design depicted in the accompanying illustration. The appearance of this trade mark on or in association with products is an indication that the products embody the results of the co-operative investigation and research of the firms associated with the Cable Research Committee.

C.R. Trade Mark.

A High-economy Steam Turbine.

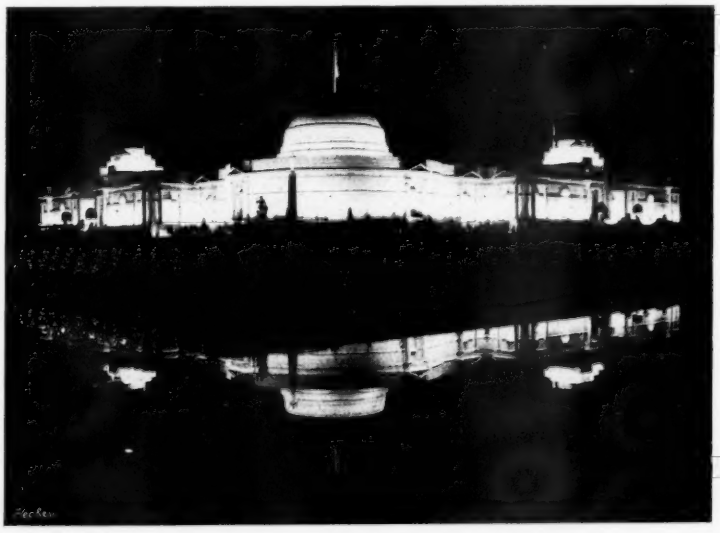
The acceptance tests of the 85,000-kW, 1,500-r.p.m. Brown-Boveri turbo-alternator installed in the Zschornewitz power station of the Elektrowerke A.G., Berlin, indicate an efficiency of 87.7 per cent., referring to steam conditions before the stop valve. It is claimed that the turbine is the most efficient in the world. The alternator has a capacity of 100,000 kVA and is designed for 6,500/13,500 V at 50 cycles. The particulars of the test are as follows :—

Steam pressure and temperature	lb. per sq. in. abs. and °F.	202 and 698.5
Cooling water temperature	°F	95.5
Terminal output	kW	83,730
Steam consumption of condensing plant	lb. per hr.	30,800
Steam consumption, including condensing plant	lb. per kWh	10,640
Steam consumption, excluding condensing plant	lb. per kWh	10,280
Alternator efficiency	per cent.	97.1
Efficiency of turbine at coupling	per cent.	87.7

The turbine is designed with two extraction points for feed heating, but the tests were carried out without steam extraction. If the turbine had been designed for operation without extraction, the overall efficiency corresponding to the same blading efficiency would presumably have been proportionally higher.

Antwerp Exhibition.

The accompanying illustration is a night view of the British Pavilion at the Antwerp Exhibition. It is an excellent example of indirect floodlighting. The work was carried out by the Belgian branch of Messrs. Campbell & Isherwood, Ltd. (Etablissements Belges Campbell and Isherwood, Société Anonyme) under the personal supervision of Messrs. Campbell & Isherwood's own officials in Belgium.



The British Pavilion at the Antwerp Exhibition, Indirectly Flood-lighted.

Steel Inspection by Magnetic Induction.

In an article in a recent issue of *Automotive Industries* of New York it is pointed out that many failures of highly-stressed components occur from fatigue, which is essentially the gradual enlargement of minute cracks that existed when the piece was manufactured. To enable cracks, seams, flaws, and non-metallic inclusions to be detected rapidly and positively, the Magnetic Analysis Corporation of New York has recently introduced apparatus whereby bar stock can be passed through two induction coils placed co-axially a short distance apart and connected in series across a.c. mains. The current passing in the primary and secondary windings is recorded by an oscillograph. The form of the electromotive force in the primary coils usually approaches a sine curve and, if the specimen bar is of normal structure, the e.m.f. induced in the secondary windings will be of similar character. Any defects in the bar will, however, distort the secondary curve in a manner indicative of the nature of the defects. Two forms of apparatus are marketed for use in laboratories and in factories, respectively; the latter equipment incorporates a semi-automatic feeding device which deals with bar up to speeds of 50 ft. per minute.

Flueless Rooms and Electric Fires.

In a letter to *The Times* in reply to an attack by Dr. Leonard Hill on the flueless room and the electric fire, Lt.-Col. W. A. Vignoles, director, Electrical Development Association, points out that electricity offers the only known method of producing light and heat without combustion and the consequent using up of the oxygen in the air. All electric heaters can safely be used without flues, but, of course, rooms must be ventilated; the mere provision of a flue does not guarantee this, as it may be, and frequently is, blocked up, often in some temporary manner. More pressing matters for consideration are the ordinary domestic gas cooker, which is almost invariably fitted without any flue, and the flueless gas radiator, which is used in some offices and shops. In both these cases the fumes are discharged into the atmosphere and breathed by the occupants of the room.

Scientific Co-operation within the British Empire.

In *The Times* on Tuesday last there appeared a full notice of an application that is to be made to the Board of Trade for a licence to form an "Association for the Promotion of Co-operation between Scientific and Technical Societies and Institutions within the British Empire."

An Electrical Summer School.

As indicated in our issue of August 1st, p. 187, the first summer school arranged by the Board of Education to deal with the domestic uses of electricity was held at the National Society's Training College of Domestic Subjects, Hampstead, from July 31st to August 14th. The Board appointed Miss C. Haslett, director, Electrical Association for Women, to organise the course, and the lectures were given by Miss M. Partridge, B.Sc., and Miss Anna Holm. The success of the course was very largely due to the generous co-operation of all sections of the electrical industry, including the Electrical Development Association, which provided the temporary wiring for the class rooms; B.E.A.M.A. firms, which supplied cookers and other domestic appliances; and the Cable Makers' Association, which supplied samples of cables. Visits were paid to the St. Marylebone power station, the E.L.M.A. Lighting Service Bureau, the "MK" factory, Belling's works, and to the Osram Lamp Works and G.E.C. Wembley Research Station. The students were domestic science and science teachers from all parts of the country, including Yarmouth, Plymouth, Rugby, Gloucester, Brighton, West Hartlepool, and Devonport, and many of them had had no opportunity of using electric cookers and other domestic appliances previous to the school. At the conclusion of the course there was no doubt that all the teachers were fired with great enthusiasm for domestic electrical methods, and were determined to see that all their centres were run on electrical lines. During the course, Dr. Smith, an official of the Board of Education, gave two very interesting lectures, showing how by means of a fairy story a simple knowledge of an electrical circuit could be given to the school child. In addition to the 40 electrical students, lectures were also given on electric cooking to 40 cookery students who were attending a summer school in the same College. The significance of this summer school is that it is the first official attempt on the part of the Board of Education to introduce some teaching on domestic electrical methods into the schools throughout the country. Seeing that this step has been taken, it would be of great assistance if supply engineers throughout the country would give whatever advice or assistance they could to the teachers in their districts. The Board of Education is very pleased with the success of the school, and it is believed that it will now be a yearly event.

Fatalities.

Whilst assisting to repair a motor lorry, John R. Shenton (32), Goodshaw Fold, Rawtenstall, was carrying an electric inspection lamp, when he called out to a man to take the lamp from him. He collapsed and died. At the inquest, on August 13th, medical evidence revealed that the man had been fatally injured as a result of an electric shock. The inquiry was adjourned. At the adjourned inquest a verdict of "Death by Misadventure" was returned. Mr. J. F. Trickett, a director of the firm, said it was deceased's duty to supervise the equipment and report defects to him; the inspection lamp was not provided by the firm. Mr. William Barrett said the lamp was not in accordance with the requirements of the Board of Trade. If the metal holder had been earthed or insulated the accident would not have occurred. It was probable that one of the strands of the cable had become loose and come into contact with the metal holder, causing the shock.

An electrician, John Hibberd (28), of Hoy Street, Canning Town, was killed recently by receiving an electric shock in a junction box at Gunter Grove, Chelsea. Hibberd, who was employed by the Chelsea Electric Supply Co., Ltd., was working inside the box on a supposed fault when his mate heard a "thud." Looking down he found Hibberd lying motionless, and he at once summoned assistance. Hibberd was taken to St. Stephen's Hospital, Fulham, where he was found to be dead.

Energy used by Power Station Auxiliaries.

Statistics regarding the amount of energy used by auxiliaries are scarce, but the Salem Electric Lighting Company, in reporting data for publication in the supplements to the *Electrical World*, states the energy consumption of auxiliaries and exciters. A report of seven months' operation of unit No. 10, Long Beach steam plant No. 3, of the Southern California Edison Company also gives the energy used by auxiliaries. As the table given below shows, the auxiliaries in these three instances used between 3 and 4 per cent. of the total energy generated:—

Location	Year	Gross Output, kWh	Auxiliaries and Exciters, kWh	Per cent.
Salem ...	1929	127,781,650	4,041,390	3.2
	1928	112,054,000	4,361,210	3.9
Long Beach	1928	285,733,200	9,628,320	3.4

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. S. A. Maddocks has been appointed transport commissioner at a salary of £1,800 per annum by the New South Wales Government, Australia, and **Mr. E. O. Milne** as chairman of the tramways and omnibuses management board at £1,500 per annum. **Mr. E. J. Doran**, the present manager of the tramways, is to retire on pension in September.

Mr. Francis G. C. Baldwin has been appointed superintending engineer of the Northern District of the Post Office Engineering Department as from August 10th. He entered the service of the National Telephone Company in 1896, and was appointed engineer at Sheffield in 1899, and district engineer for Birmingham in 1906. In 1909 he was appointed assistant metropolitan engineer, and later acting metropolitan engineer. Mr. Baldwin's first appointment with the Post Office was in London as sectional engineer of the City External Section in 1912. In December, 1913, he was promoted to the rank of assistant superintending engineer of the Northern District. He was chairman of the North-Eastern Centre of the I.E.E. in 1922.

Mr. J. A. Attwood, inspector at Weymouth in the Engineers' Department of the Post Office telephone service, is retiring on September 2nd after 40 years' association with the service.

Mr. J. C. Fairchild, who was recently appointed transport manager and electrical engineer at Lytham St. Annes, has been confirmed in that position and his salary has been increased by £100 a year in consideration of extra duties.

Sir H. Cassie Holden and **Mr. F. de F. England** have been elected directors of Everlite, Ltd., the **Marquess of Winchester** (chairman) and **Mr. H. J. Bruce** having retired from the board.

Mr. Arthur R. Glithero, who has been for some years on the editorial staff of the Electrical Press, Ltd., has resigned from that position in order to take up an appointment on the editorial staff of the Colliery Guardian Co., Ltd.

Col. Sir Joseph Nall, D.S.O., and **Mr. H. England** have been elected vice-presidents of the Tramways, Light Railways and Transport Association.

Mr. A. Victor Cross, formerly of the Doncaster and Leigh Electricity Departments and Callender's Cable & Construction Co., Ltd., was to sail to-day (Friday) for Nigeria to take up an appointment with a Liverpool shipping and merchant firm.

Obituary.

Mr. W. B. Phelp.—We learn with regret that Mr. Walter Bernard Phelp, general manager of the British General Electric Co., Ltd., South Africa, was killed in an automobile accident under tragic circumstances at Pontresina, near St. Moritz, on August 10th. Mr. Phelp, who was 57 years of age, joined the G.E.C. as an office boy; his abilities were soon recognised, and after promotion and experience at the company's head office and its branches (he was at Cardiff for several years), he was selected by the directors to inaugurate the Cape Town branch nearly 27 years ago. From small beginnings there has been developed, under Mr. Phelp's personal supervision, a business of wide extent and many ramifications, with its headquarters at Johannesburg, branches at Cape Town, Port Elizabeth, and Durban, and agencies in Salisbury, Bulawayo, and East London. Mr. Phelp devoted a good deal of his leisure to promoting the social and business welfare of trade organisations, and occupied many important positions in the business and commercial life of South Africa.

Sir William Walker.—We regret to learn of the death, on August 17th, of Sir William Walker who was Chief Inspector of Mines until 1921. After training as a mining engineer and acting as manager to various collieries, he joined the Home Office inspecting staff in 1889. He became acting chief inspector in 1917 and chief inspector about two years later. He was knighted in 1922.

Dr. G. Stein.—The death occurred recently in Budapest, at the age of 70 years, of Dr. Ing. Gotthold Stein, a well-known Hungarian electrical engineer, who was associated for many years with Ganz & Co.

Wills.—The late **Sir Robert Harvey,** a director of a number of companies, including the Lima Light, Power & Tramways Co., left estate valued at £276,874 (net personalty £253,954).

Mr. Edward John Chambers, the late chairman of H. and T. Danks, Ltd., boilermakers and engineers, and formerly managing director of Bullers, Ltd., left £11,572 gross (£8,444 net personalty).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Dixon & Sepulchre, Ltd.—Private company. Registered August 13th. Capital £10,000 in £1 shares (6,000 ordinary and 4,000 7½ per cent non-cumulative participating preference). Objects: To carry on the business of manufacturers of and dealers in fittings and appliances used in connection with the generation, production, accumulation, supply, consumption or employment of electricity, gas, petroleum, &c. The directors are: Cecil Dixon, Beauparc, Uxbridge Road, Hampton Hill; Cyril Dixon, La Touraine, Strawberry Vale, Twickenham; and D. Sepulchre, 1, Rue Lebeau, Liége, Belgium. Cecil Dixon is the first chairman and secretary. Registered office: 36, Duke Street, E.C.3.

Wholesale Electro (Halifax), Ltd.—Private company. Registered August 14th. Capital £4,000 in £1 shares. Objects: To acquire the business of a manufacturer of and dealer in radio and electrical apparatus carried on by A. Buckley at Lower George Yard and Gaol Lane, Halifax, as "The Wholesale Electro Supply Stores." The permanent directors are: A. Buckley, 9, Lingroyde Avenue, Highroad Well, Halifax; J. F. Buckley, 7, Vine Terrace, Halifax; W. H. Buckley, 1, Lower Skircoat Green, Halifax. Solicitors: Frederick Walker and Son, 2, Harrison Road, Halifax.

Wade & Mills, Ltd.—Private company. Registered August 14th. Capital £500 in £1 shares. Objects: To acquire the business of electrical and general engineers carried on by F. A. Wade and F. Mills, at 195, Lees Road, Oldham, as "Wade & Mills." The first directors are: F. A. Wade, 48, Greenhill Road, Middleton Junction; and F. Mills, 304, Abbey Hills Road, Oldham, electrical contractors (both permanent). Solicitors: Mellor and Jackson, Oldham.

J. Gledson & Co., Ltd.—Private company. Registered August 14th. Capital £15,000 in £1 shares (5,000 preference and 10,000 ordinary). Objects: To acquire the business of a manufacturers' agent and wholesale factor of electrical and wireless materials carried on by J. Gledson at 48 and 50, Blackett Street, Newcastle-on-Tyne, as "J. Gledson & Co." The directors are: J. Gledson and W. R. Gledson, 103, Moorside North, Fenham, Newcastle-on-Tyne; G. S. Killey, 3, Eastlands, Newcastle-on-Tyne. Solicitors: Charles E. Layne and Son, 4, Eldon Square, Newcastle-on-Tyne.

Official Returns of Electrical Companies.

Cleveland and Durham Electric Power, Ltd.—Satisfaction to the extent of £225,000 on various dates between July 11th and 26th, 1930, of debentures authorised September 29th, 1913, and registered December 19th, 1913.

Weston Electric Lamp Co., Ltd.—Satisfaction on July 31st, 1930, of debenture dated April 16th, 1930, and registered April 22nd, 1930. (According to the register of mortgages, the debenture registered April 22nd, 1930, originally secured £396 15s.)

A. J. Bennett & Co., Ltd.—Debenture dated July 31st, 1930, to secure £750, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: A. D. Wood, F. C. D. Wood, and B. E. Wood, all c/o Wood & Sons, St. Andrews Hill, E.C.4.

Montague Radio Inventions & Development Co., Ltd.—Particulars filed of £600 debentures authorised July 23rd, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Edward Dewhurst, Ltd.—Charge on 47, Fishergate and workshop and blacksmith's shop in Theatre Street, Preston, dated July 28th, 1930, to secure £750. Holders: J. C. Rhodes, 6, Avenham Terrace, Preston; and others.

Peto Scott Co., Ltd.—Particulars filed of £4,000 debentures authorised July 28th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued; also £6,500 debentures authorised July 28th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital (subject to £4,000 debentures of same date but previously registered), the whole amount being now issued.

Aeonic Radio, Ltd.—C. J. G. Palmour, 4b, Frederick's Place, E.C.2., ceased to act as receiver and/or manager on August 1st, 1930.

Bowyer-Lowe Co., Ltd.—R. L. Marsh, 73, Ethelburga House, Bishopsgate, E.C.2., ceased to act as receiver and manager on July 14th, 1930.

Hart Bros. Electrical Manufacturing Co., Ltd.—Particulars filed of £5,000 debentures authorised July 30th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Howard Electrical Co., Ltd.—E. H. Palmer, Bentinck Buildings, Wheeler Gate, Nottingham, was appointed receiver on July 31st, 1930, under powers contained in debenture dated January 15th, 1923.

Electric Heating & Hardware, Ltd.—Debenture dated July 24th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital and collateral deposit on same date of deeds of freehold manufacturing works in Walsall Road, Perry Barr, Birmingham, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Electrolumination (Abadie Process), Ltd.—Issue on July 25th, 1930, of £200 debentures part of a series already registered.

Rushden & District Electric Supply Co., Ltd.—Issue on July 31st, 1930, of £1,200 debenture stock part of a series already registered.

General Cable Manufacturing Co., Ltd.—Debenture dated July 28th, 1930, to secure £1,470, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. Bisseker, 1, Balderton Street, W.

City Notes.

Radio Corporation of America.

The *Financial Times* states that the Corporation reports a net income of $505,000 for the first half of the current year, against $4,996,000 for the corresponding period of 1929. To meet the half-yearly dividends on the preferred stocks the surplus has been drawn upon to the extent of $30,195,000. Mr. David Sarnoff, president of the R.C.A., is reported to have stated that it was confidently hoped that operations for the latter half of the year would prove much more satisfactory.

Companies Struck Off the Register.

The following companies have been struck off the Register and they are thereby dissolved:—

Alklum Electrics, Ltd.
British Wireless Supply Co. (1924), Ltd.
Frank Craft (Castleford), Ltd.
Radio Equipment Co., Ltd.
Radio, Phonopore & Electricals, Ltd.
Standard Electric Sign Co., Ltd.

Bognor Gas & Electricity Co., Ltd.

The following dividends have been declared for the half-year:—Ordinary stock and additional "A" consolidated stock, at the rate of 8 per cent. per annum; "B" consolidated stock, at the rate of 9.2 per cent. per annum; and new consolidated stock, at the rate of 7 per cent. per annum.

Pinchin, Johnson & Co., Ltd.

An interim dividend of 10 per cent. has been declared on the ordinary shares. Last year's rate is thus maintained on an increased capital.

Rangoon Electric Tramway & Supply Co., Ltd.

The company has notified its shareholders that it proposes to issue to them the balance of the authorised ordinary capital (£150,000) on a *pro rata* basis.

Canadian General Electric Co.

A quarterly dividend of 75 cents per share (at the rate of 6 per cent. per annum) has been declared on the common stock.

Clyde Valley Electrical Power Co.

An interim dividend has been declared of 3 per cent., less tax, on the ordinary shares.

Newcastle-upon-Tyne Electric Supply Co., Ltd.

The interim dividend on the ordinary shares is maintained at 2½ per cent.

French Companies.

The *Société d'Electricité de Paris* has obtained authority to increase its capital from 25 to 155 million francs, and eventually to 310 millions. The object is to effect important extensions which may possibly include the construction of a new generating station at St. Denis.

The *Société des Téléphones Grammont* reports a profit of 1,466,000 fr. for 1929. After providing for the reserve fund the balance has been carried forward, together with 1,083,000 fr. from 1928.

Stocks and Shares.

TUESDAY EVENING.

THE fact that the price of the five per cent. War Loan stands at what is practically a record figure since the issue of the stock was made at 95, it may be recalled, thirteen years ago, is illustrative of the outstanding feature of Stock Exchange markets as a whole. In other words, the appetite for gilt-edged securities is so insatiable that prices are being forced up to levels at which the yield on the money comes to well under the desired 5 per cent. The new London Electric 5 per cent. debenture stock, which came out a few weeks ago at 97½, is now quoted at 3¾ premium. The fully-paid stock stands at 101¼. Nor is there any appreciable amount of the stock to be obtained, although even in the market it is sometimes said that the present quotation looks high enough, in view of the fact that the security has no more than a partial cover from the Government, 3 per cent. being guaranteed for fifteen years. In a list of thirty-one stocks in front of us at the present time, all concerned with debenture and preference issues, there is only one against which stock is marked as being on offer, and this is £2,000 Metropolitan District 4 per cent. debenture, which can be bought at 76½, to yield 5¼ per cent. on the money, with interest due in January and July. In all the other stocks, there is none available for the would-be buyer.

Insatiable Investment.

Amongst industrial debenture stocks, the Pirelli-General Cable Works 5½ per cent. first mortgage guaranteed, the offer of which was mentioned here at 100¾ on July 11th (ELECTRICAL REVIEW, page 71), has now risen to 102¼, and the amount available is steadily shrinking. At the moment, there is £5,000 stock in the market, and at the price quoted the yield comes to £5 7s. 3d. per cent. North Metropolitan Power Station 5 per cent. second debenture, of which mention was also made here when £100,000 stock was being placed at 97½, is now 2 points higher, showing a return, at 99½, of £5 0s. 6d. per cent. on the money. Edmundsons' Electricity Corporation 5 per cent. debenture stock, which came out at 93¾, and was left substantially with the underwriters, is now 95¼, and Newcastle-on-Tyne Electric 5 per cent. consolidated debenture stock, which was available at 96 on the prospectus, stands at 4¼ premium. In the cases of these four stocks, renunciation-letters or free stock can be obtained, thus avoiding the stamp duty of 1 per cent. Another stamp-free stock which can be obtained is a modest amount of County of London Electric 5 per cent. debenture. Out of £200,000 stock offered a few weeks, ago, all but a few thousand pounds has now been absorbed by investment. The price asked for what remains is 102, at which the return on the money comes to £4 18s. per cent. North-West Midlands Joint Electricity Authority 5 per cent. stock, 1950-1970, is offered as to £10,000 at 99½, free of stamp, with interest on 1st January and July.

The same process of absorption is going on amongst preference shares, where the best-class issues pay little more than 5 per cent. on the money. A thousand Metropolitan Electric 4½ per cent. preference, and the same number of Westminster Electric 4½ per cent. preference, are on offer at 18s., giving at that figure the round 5 per cent. on the money, and with dividends due in each case in January and July.

Home Railway Stock.

The strength of the Underground Electric issues is well maintained, and there continues to be a quiet demand for Metropolitan consolidated ordinary. The price of the latter is ½ up, at 68, at which the return comes to £5 17s. 8d. per cent. on the money, though anticipation looks for an increased dividend over the 4 per cent. declared in respect of 1929. Districts pay rather more than 6½ per cent. on the money, and Underground Electric shares yield 6⅝ per cent. Optimism insists that the Underground Electric Railways Company is likely to raise the dividend on these shares in respect of the current twelve months, though the cautious view takes the line that, having regard to the heavy capital expenditure to which the company is committted, the directors will adopt a conservative policy in the matter of dividend distribution on the £1 shares. It is generally assumed, however, that the 8 per cent. rate is likely to be maintained. Central London assented ordinary stock has advanced to 78.

Electricity Supply Shares.

Apart from the few ex-dividend markings, the changes in the list of Home Electricity supply shares are almost negligible. Amongst the prices recently quoted ex dividend are those for Westminsters, Metropolitans, Bournemouth, and Charing Cross. The disposition has been for prices to recover the deductions. North Metropolitan Electric 6 per cent. preference have strengthened to 23s. 6d. Clyde Valley shares at 38s. 3d. are unchanged upon declaration of a 3 per cent. dividend, the same as that of a year ago. There were then, however, 900,000 ordinary shares less for the dividend to be paid upon than there are at present.

Amongst the prices which are not quoted in our weekly lists are 26s., the preference 23s. 3d., and Egham and Staines 30s. change Account Day. These include Northamptons, 42s., and Richmond (Surrey) at 40s. 6d. Isle of Thanet ordinary are 26s., the preference 23s. 3d., and Egham and Staines 30s.

Amongst the foreign shares, Atlas ordinary are lower at 24s. 6d., the preference being unchanged at 24s. 3d. Prussian Electric 6 per cent. 25-year sterling bonds have fallen 2 points to 87½.

Manufacturing and Equipment Weakness.

In the manufacturing section British Insulated are 5s. lower at 3¾. Callenders have dropped to the same price. Brush stock remains weak at 112½. G.E.C. ordinary have given way to 48s. 9d., and of the lower-priced shares, English Electrics fell back to 14s. 6d. Associated Electrical Industries ordinary weakened to 23s. 3d. The only improvement in the group is that in Telegraph Constructions, which gained another 10s. on the top of the rise secured last week. The present price is 18½, as compared with 17 at one time last month, and 23 at the beginning of the current year. Henleys are 5/16 down at 5¾, and it is said that a couple of deceased accounts are responsible for the decline in the price. Executors often find nowadays that there are shares which they would like to realise if they were able to do so, but for which there are no buyers. The consequence is that, in order to meet immediate expenses, it becomes necessary to sell such stocks and shares as those in which there is any market, and prices are put down for reasons quite extrinsic to considerations affecting a company itself. Philips Lamps are lower at 2 11/16.

Dollar Stocks.

The group of Latin Canadians is anything but happy. The American group is dull, and it takes very little offering of stock to bring about a sharp fall. Brazilian Tractions maintain their price; Shawinigan Water, at 65½, is a half point to the bad. Power Corporation of Canada shows a fall of 2 at 67. Pennsylvania Water & Power at 75 has put on 1. No change worthy of mention has occurred amongst Mexicans, but Monterey debenture is 2 higher at 62½.

The Royal Bank of Canada, in one of its recent letters, mentioned the Dominion as being the third largest producer of electrical energy in the world. The United States stands first, and Germany second. Canada has a total installation of 5,700,000 horse power, and within the next half-decade this is expected to be raised to nearly 9,000,000 horse power.

Cable Stocks.

The prices of the three Cables & Wireless stocks, preference, "A" ordinary, and "B" ordinary, have now reached a point at which £100, nominal, of each stock can be acquired by the expenditure of about £100 for the three. This is not much more than a third of the amount which at one time it was necessary to pay in order to buy £300 of what is called the mixture. Prices have again given way this week. Other members of the Telephone & Telegraph market are steady. American Telephone & Telegraph, after being down to 210, recovered to 214½. International Telephone & Telegraph keeps at 44½. Marconi Marines are 38s. 9d., Oriental Telephones have drooped. The Ericsson Telephone Company is stated to be endeavouring to acquire control of Luth & Rosen, of Stockholm, an electrical machinery company with a share capital of £250,000. Ericsson Telephone 7 per cent. preference shares are quoted in London at a guinea.

Venezuela Telephones.

The Venezuela Telephone & Electrical Appliances Company has convened a meeting for the purpose of obtaining authority to negotiate a fusion of interests between this company, the "local" company, and the public of Venezuela. A telephone franchise covering the whole area of the Republic was granted by the Venezuela Government to important nationals for a period of thirty years, and this franchise has been transferred to the local company just mentioned. The directors state that the scope of the company's activities could be enlarged, and that, in order to carry this out, increased borrowing powers have become necessary. The meeting is to be held on September 10th, and shareholders are invited to send proxies in favour of resolutions which the directors recommend shall be adopted. The price of the shares is about 23s., for ordinary and preference alike. The "A" ordinary shares are quoted at 19s., but are difficult to sell.

Miscellaneous Matters.

Babcock & Wilcox shares are weak, giving way to 51s. 3d. on pressure to sell on an unwilling market. Rubber shares have failed to improve, though the price of the produce is a little above the lowest, at 5½d. per lb. The iron, coal, and steel group is dullish. Amongst foreign traction shares, Anglo-Argentine Tramway 6 per cent. first preference have recovered a trifle to 2 1/16. The company's 5 per cent. debenture stock at 56 shows further weakness. The Rangoon Electric Tramway & Supply Company proposes to issue, at a price at present unstated, 150,000 new ordinary shares. The price of the existing shares is about 30s. 6d. Industrials, taken as a whole, are depressed. A considerable volume of liquidation is in progress. In the endeavour to raise money required for meeting obligations incurred through speculation or bad trade, people are selling without regard to the merits of companies and the shares in them.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Aug. 19 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	56/3xd	—	5 4 3
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary ...	1	8½	8½	27/6xd	—	5 1 10
do. do. 4½% Pref. ...	1	4½	4½	18/-	—	5 0 0
Chelsea	1	8½	8½	26/6	—	5 5 8
City of London	1	10	10	38/9	—	4 3 1
do. do. 6% Pref.... ...	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	38/3	—	4 3 9
County of London	1	7	10	45/-	—	4 9 0
do. do. 6% Pref....	1	6	6	23/6	+6d.	5 2 2
Edmundson's 7% Pref. ...	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation ...	1	11	11	48/3	—	4 11 3
Kensington Ordinary ...	1	8	8	27/-	—	5 3 8
Lancs. Light and Power ...	1	7½	7	24/-	—	5 16 8
London Electric	1	8½	9	30/-	—	4 13 4
Metropolitan	1	9	10	40/-xd	+6d.	5 0 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	31/3	—	5 2 5
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 4
North Met. Elec. 6% Pref....	1	6	6	23/6	+6d.	5 2 2
St. James' and Pall Mall ...	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	28/-	—	5 14 4
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	27/6xr	—	5 1 10
Westminster Ordinary	1	8½	8½	27/-xd	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	31/3	—	5 2 5

Home Rails.

Central London Ord. Assented ...	Stock	4	4	77	—	5 4 0
Metropolitan	,,	8½	4	68	+½	5 17 8
do. District	,,	4	5	76	—	6 11 7
Underground Electric	£1	7	8	24/-	—	6 13 4
do. do. Income ...	Bonds	6	6	106	—	5 13 3

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	100	—	6 0 0
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	10	12½	35/-	—	7 2 10
Cables & Wireless 5½ Pref.... ...	Stock	—	5½	74½	—1	7 7 8
do. A 7½ Ord.	,,	—	—	21½	—1	... ...
do. B Ord.	,,	—	—	10½	—½	... ...
Globe Tel. and T. Ord.	10	10	10	15½	—	*6 9 0
do. do. Pref.	10	6	6	10¾	—	5 11 7
Great Northern Tel.	10	20	20	29½	—	6 15 7
Marconi-Marine	1	12½	15	38/9	—	7 15 0
Oriental Telephone Ord.	1	12	12	51/3	—⅛	*4 13 7

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	2⅛	+⅛	13 6 8
do. do. 2nd Pref. ...	5	6	6	2	—	15 0 0
do. do. 5% Deb. ...	Stock	5	5	56	—½	8 18 6
British Electric Traction Def. Ord.	,,	5	5	1450	—	... ...
do. do. Pref. Ord.	,,	8	8	123½	—	6 6 6
Brazil Traction	100	7	8	35½	—	5 12 8
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	91½	—	5 9 3
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	9/-	—	... ...
London United Tram Deb. ...	Stock	4	4	52½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	59	—	8 9 8
Mexican Light Common	100	Nil	Nil	65	—	... ...
do. 7% Pref.	100	7	7	76½	—	9 3 0
do. 1st Bonds	—	5	5	79	—	6 6 7
Victoria Falls Ord.	1	15	15	59/6	—	5 0 10
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	23/3	—6d.	5 3 3
Babcock & Wilcox	1	13	15	51/3	—3/3	*5 17 0
British Aluminium Ord.	1	10	10	38/9	—	5 3 8
British Elec. Transformer Pref. ...	1	7	7	8/9	—	... ...
British Insulated Ord.	1	15	15	3¾	—¼	4 9 0
Brush Ord.	Stock	10	10	112½	—	8 17 10
Callenders	1	15	15	3¾	—¼	4 9 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	—	30	23/9	—	6 6 4
do. 8% Pref.	1	8	8	25/9	—	6 4 3
Edison-Swan 1st. Pref.	1	7½	7½	26/3	—	5 14 3
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	5½	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	44	—	6 1 1
English Electric	1	Nil	Nil	14/6	—6d.	... ...
do. do. Pref.	1	8	Nil	11/3	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/3	—	5 10 7
do. Ord.	1	10	14	48/9	—9d.	5 14 9
Henley	1	25	30	5¾	—⅛	5 6 9
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	7/6	—	... ...
Johnson & Phillips	½	10	10	1¾	—	5 6 8
Siemens Ord.	1	7½	7½	22/-	—	6 16 4
Telegraph Construction	12	10	10	18½	+½	*6 9 10

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during July.

THE Board of Trade returns for July show that, although both exports and imports generally were higher than in June, they were considerably lower in value than in July last year. The increase, as compared with the previous month, is attributable to the fact that June was a shorter month and included the Whitsun holidays. So far as the electrical trade was concerned, similar conditions applied. The most noticeable fact brought out by our table is that for the first time the total for the completed portion of the year (seven months) was below that for the corresponding period of last year, while imports were over a million pounds higher in value.

The increase of £265,488 in July exports, as compared with June, was fairly general. The machinery section showed an advance of £99,629, and telegraph and telephone apparatus one of £102,091. Insulated wires and cables and unenumerated goods also rose by over £30,000. There was a substantial decrease (£30,172) in exports of batteries and accumulators. As compared with July, 1929, there was a considerable rise (£66,899) in electrical machinery exports, and glow lamps also recorded a large increase. These, however, were counterbalanced by falls of £59,087 in exports of insulated wires and cables, and £58,651 in the telegraph and telephone section. The decrease, as compared with the corresponding month of last year, is the fourth in succession. It may be noted that it has been entirely due to a decline in exports of goods and apparatus; machinery has shown an increase of about £142,000 so far this year.

The import list shows that the principal increases, as compared with June, occurred in the cases of glow lamps (£46,125) and insulated wires and cables (£28,731). For the rest, the increases and decreases were about equal. In comparison with July last year, meters and instruments made the greatest advance (£75,288), with glow lamps (£38,210) second. There were substantial declines in the imports of telegraph and telephone apparatus (£33,533), unenumerated goods and apparatus (£23,723), and batteries and accumulators (£22,948).

There was a further rise in the re-export total, due mainly to greater shipments of telegraph and telephone apparatus, raising the total increase for the first seven months of the year to £210,603.

Destination.	Quantities. July, 1929. Tons.	Quantities. July, 1930. Tons.	Quantities. Inc. or dec Tons.	Values. July, 1929 £	Values. July, 1930. £	Values. Inc. or dec. £
Europe	558	597	+ 39	105,626	112,336	+ 6,710
Japan	138	78	- 60	22,041	14,483	- 7,558
South America ...	320	301	- 19	53,163	50,042	- 3,121
South Africa ...	302	220	- 82	44,396	31,795	-12,601
British India ...	592	789	+197	110,439	114,997	+ 4,558
Australia	389	447	+ 58	56,413	66,952	+10,539
New Zealand ...	122	88	- 34	18,358	14,954	- 3,404
Canada	167	216	+ 49	24,045	28,653	+ 4,608
Other countries ...	556	1,015	+459	81,833	149,001	+67,168
Total ...	3,144	3,751	+607	516,314	583,213	+66,899

The inset table shows how the increase of £66,899 in the value of electrical machinery exports, as compared with July, 1929, was arrived at. The increase in total weight was over 19 per cent., but the value rose by only 13 per cent. The largest amount in the table and the greatest increase are shown against "Other countries." The share of India, the leading specified market, advanced by 33 per cent. in weight, but only by 4 per cent. in value. On the other hand, Australia's share represented an advance of about 15 per cent. in weight and nearly 19 per cent. in value. If "Other countries" are presumed to be non-British, electrical machinery exports were divided as follows:—Empire countries £257,351, and foreign markets £325,862.

	Exports. Electrical exports for July, 1930.	Exports. Inc. or dec. as compared with June, 1930.	Exports. Inc. or dec. as compared with July, 1929.	Imports. Electrical imports for July, 1930.	Imports. Inc. or dec. as compared with June, 1930.	Imports. Inc. or dec. as compared with July, 1929.	Re-Exports. Electrical re-exports for July, 1930.	Re-Exports. Inc. or dec. as compared with June, 1930.	Re-Exports. Inc. or dec. as compared with July, 1929.
Electrical goods and apparatus (unenumerated)	£261,710	+£32,223	- £17,309	£120,995	- £2,905	- £23,723	£11,188	+£3,876	+£2,442
Insulated wires and cables ...	259,234	+ 33,545	- 59,087	91,193	+ 28,731	+ 15,149	1,240	+ 584	+ 601
Glow lamps	82,348	+ 18,749	+ 22,391	72,437	+ 46,125	+ 38,210	449	- 433	- 3,072
Arc lamps and parts	852	- 423	- 4,490	1,112	- 585	+ 247	553	+ 535	+ 546
Batteries and accumulators ...	63,169	- 30,172	- 24,520	39,924	+ 1,506	- 22,948	158	- 1,624	- 1,763
Meters and instruments ...	29,152	+ 4,521	- 11,165	101,551	+ 272	+ 75,288	8,620	- 4,226	+ 8,491
Carbons	2,277	+ 1,756	+ 1,940	14,770	+ 1,246	+ 4,548	662	+ 646	+ 566
Switchboards (not telegraph or telephone)	8,598	+ 3,229	+ 3,833	52	- 38	+ 52	—	—	—
Electrical Machinery—									
Electrical machinery (unenumerated)	342,958	+ 27,948	+ 30 246	141,020	- 4,735	+ 2,974	13,446	+ 1,500	+ 3,830
Railway and tramway motors	9,377	+ 3,845	- 23,847	—	—	—	—	—	—
Other motors and generators...	230,878	+ 67,836	+ 60,500	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	66,759	+ 11,368	- 26,696	1,323	- 1,350	- 3,679	—	—	- 1
Submarine telegraph and telephone cable	6,646	- 11,028	- 25,530	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	259,289	+ 102,091	- 6,425	57,277	+ 3,796	- 33,533	20,504	+ 12,449	+ 12,486
Totals...	£1,623,157	+£265,488	- £80,159	£641,654	+ £72,063	+ £52,585	£56,820	+£13,307	+£24,126
Increase or decrease for first seven months of 1930			Exports -£47,586			Imports +£1,017,761			Re-Exports +£210,603

Commonsense Correspondence.

The author urges business-letter writers to abandon the jargon which is accepted practice in favour of plain English.

By ASHLEY HOBARTE.

IT seems surprising in these days of intensive manufacture, market surveys, and special advisory and economic councils, that progress in publicity, in the first principles of advertising, is dead slow. Suppose that we were to leave alone for, say, twelve months any research work into the development of manufacture and were to concentrate entirely on developing the great force of salemanship-advertising; then manufacturing research, as we know it at present, would be intensified to keep up with the results of salesmanship instead of taking advertising along like a naughty child as something only to be endured. But what little do we know actually of sales stimulus? In every branch of publicity, whether it be advertising in the popular or technical Press, catalogue production, showcard design, or mail-order sales, there has been little advance upon the work put out five or ten or twenty years ago. There are exceptions, of course, but, generally, the criticism holds good.

Let us turn from the destructive to the constructive. Consider one of the elementary lessons in publicity—the writing of a sales letter. I was talking to a business man quite recently, who said: "My chief insists on a certain style in correspondence. He insists that I commence all my letters, 'Dear Sir, We have to thank you for your letter of prox., ult., inst.'" Now I maintain that this chief wants educating. Letter writing, whether in reply to an inquiry, referring to an order, or relating to buying is merely the necessary use of the services of the Post Office instead of the personal representative.

Then, why on earth shouldn't the message be given in the language of the representative! Fancy the representative going to the buyer with the remark: "In reply to your letter of the 10th instant, I have pleasure in handing you, &c."! Exactly what he would say depends, of course, upon the individual; and in like manner each letter given to the dictaphone or the typist should be the individual message of the indoor salesman who replies to the communication. Suppose, for example, an inquiry was issued from the Southcaster Electricity Department for three dozen cookers. The average reply received would commence: "We thank you for your esteemed inquiry, &c.," and carry on: "We have much pleasure in advising you that these cookers can be delivered *ex* stock," with the usual finish: "Assuring you of our best endeavours" or some similar absurdity. What would the salesman *say*? What would *you* say if you were told to go along with the inquiry and to bring the order back? "Mr. Robinson, I'm from Johnson's. I want to talk about the three dozen cookers you wrote to us about last Tuesday. Johnson's didn't get your last order, but we are optimistic enough to hope for better luck this time. There are no appreciable differences in our cookers from the last time we quoted for your contract, except perhaps this one little point; it is small, we know, but it makes just a little difference." Possibly the difference between the loss of the order and the walking away with it. And so on.

But let us stay with the Southcaster Electricity Department and turn up their inquiry. How is it worded? The same old phrases are used year after year—so old that they can hardly sit on the paper. We are all concerned in selling electricity in one way or another. Thousands, hundreds of thousands, of meaningless epistles go out in the course of the year carrying no message at all. "But," you say, "everyone cannot write a good business letter." It is admitted that they cannot, but why not call together a small committee from your staff to meet, say, once a fortnight or once a month to consider all correspondence emanating from your works or office to see whether each type of letter is in effect a true indoor "sales representative." Circular letters can be studied by this committee unless, of course, you have the services of a competent publicity manager. You will soon find that this will lead to better letters, the first step to the introduction of a knowledge of publicity. This idea isn't a new one, and no credit is claimed for it. (I remember sitting on a similar committee during the war trying to devise circular letters which had to go out from a particular H.Q.)

For a start, this committee might well consider the revision of the standard letter-heading used. What hopeless specimens one does come across! And if the idea of a change is mooted—you know the reply one gets: "My dear sir! The Electricity Committee has used that heading for twenty-five years!" So the Electricity Committee is working on the accepted practice of twenty-five years ago; how can one expect it to accept 1930 sales methods? Then there is the "follow-up" letter. How many inquiries are received which are replied to and then forgotten? I have had the experience quite recently of making application for additional power points at my own residence. Nearly two months have passed since I decided not to proceed with the job because I felt the price asked to be excessive. And the job will be forgotten by the U.D.C. Electricity Department. I say so deliberately because I know it. If the following up of my inquiry is neglected—so must also be hundreds of others. It isn't the chief's fault. He's a busy man, and has his hands full. But if he was to ring for his chief clerk and ask how many inquiries have been received each week, with the numbers of successful orders, and insist on seeing a return of "follow-ups" to those who fail to reply to the offer put out, then the number of new consumers would be increased surprisingly. These follow-up letters are work for the "Letter Committee."

And so we have looked upon one phase, an elementary phase maybe, of publicity. We can carry our studies into other fields, but here is just one line of thought to commence with—others will suggest themselves as we make a deeper study of the subject.

The Pykara Hydro-electric Scheme.

[From Our Indian Correspondent.]

NOW that operations in connection with the Pykara hydro-electric scheme have been commenced, fuller details have been made available regarding the engineering particulars of the scheme as sanctioned by the Secretary of State for India. The total cost of the scheme is estimated at Rs.126 lakhs.

Though construction will take three years to complete, power will be delivered by the end of 1931. The scheme sanctioned is for developing a maximum of 21,000 h.p. for supply to the Nilgiris and Coimbatore districts only. As the demand increases, additional reservoirs will be constructed so that ultimately the full power (100,000 h.p.) will be utilised.

The waters of the Pykara river will be diverted by a small dam constructed across the river about a mile above the main falls and an aqueduct 7,000 ft. long will convey them to a forebay on the edge of the plateau. They will be supplemented by another and independent supply from a reservoir formed by a dam at the Glen Morgan development. The effective storage provided by these means is about 84 million cu. ft. and this will serve all purposes of regulation for a number of years. For the ultimate development there will be a gradual construction of further reservoirs on the upper reaches of the river and its tributaries.

From the forebay the water will be taken through a pipe which lower down branches into two high-pressure penstock pipes, and these will carry the water down the hill-side to the power house 3,000 ft. below. The cost of these pipes alone, with their supports when erected, will be about Rs.18 lakhs. A permanent electric haulage track will be laid alongside the pipes to convey men and materials between the top and the bottom of the plateau. The penstock pipes will end in a manifold from which water will be led to three turbo-generator units each of 10,500-h.p. capacity. One of these will be a spare for use in emergencies. Power will be generated at 11,000 V and transformed up to 66,000 V for transmission to Coimbatore. When the demand for power increases additional plant will be installed and the transmission voltage raised to 110,000 V.

A double circuit 66,000-V line 50 miles in length will carry power to the Coimbatore sub-station where the major portion of the energy will be consumed in the initial stages of the project. Branch lines at 22,000 V will radiate from this sub-station to other centres in the district. The Nilgiris district load will be catered for by branch lines from the Pykara power house itself.

A scheme has been drawn up for granting loans to such of the potential users as require aid in converting to electricity. Measures will also be taken in co-operation with the Agricultural and Industries Departments to demonstrate the economic practicability of irrigation by electric pumping from a group of wells in any area. It is estimated that the rates at which the power will be sold will within five years average about ¾ anna per kWh to distribution authorities, and a further decrease may be expected with the increase in demand.

High-power Rectifiers.

Notes on Equipment Recently Installed in England by British Brown-Boveri, Ltd.

THE accompanying illustrations show two high-power rectifier installations recently put down in this country by British Brown-Boveri, Ltd. Extremes of sizes are represented, fig. 1 showing a 400-kW set at High Wycombe, and fig. 2 depicting two 3,000-kW equipments at St. Marylebone.

The High Wycombe plant was supplied to the Wycombe (Borough) Electric Light and Power Co., Ltd. (Edmundsons Electricity Corporation, Ltd.). It is rated at 400 kW and supplies current at 420 volts d.c. to the lighting and power network. The high-pressure supply is three-phase at 5,300 volts, 50 cycles. Though this plant is arranged for manual operation, it is left unattended, and it is one of four similar equipments already supplied to Edmundsons Electricity Corporation; a fifth set is in hand for the same concern.

The units supplied to St. Marylebone are claimed to be the largest in operation in this country. They are installed in the Blandford Street sub-station of the St. Marylebone Borough Council. Each set is rated at 3,000 kW, 490/530 volts, d.c. The incoming supply is 3-phase at 6,600/6,900 volts, 50 cycles. Regulation of the d.c. pressure is effected by means of tappings on the h.p. side of the windings of the transformers, "on-load" tap-changing step-switches being provided for a total of 20 steps. The step-switches are mounted inside the tanks of the transformers, the spark switches, with discharge resistances, being placed on top of the insulators outside the tanks. The step-switches for each phase are mechanically coupled and operated, either by hand at the transformers themselves or by remote control from the switchboard. The vacuum pumps are automatically controlled in accordance with the state of the vacuum within the rectifiers. Some idea of the relative dimensions of the equipment can be formed by comparing the height of the attendant with that of the rectifiers and transformers. The sets occupy very little space for the output converted.

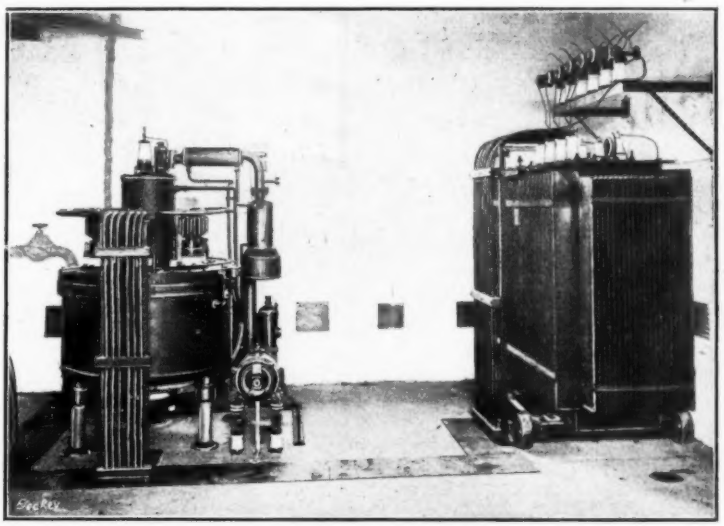


Fig. 1.—400-kW Rectifier Set at High Wycombe.

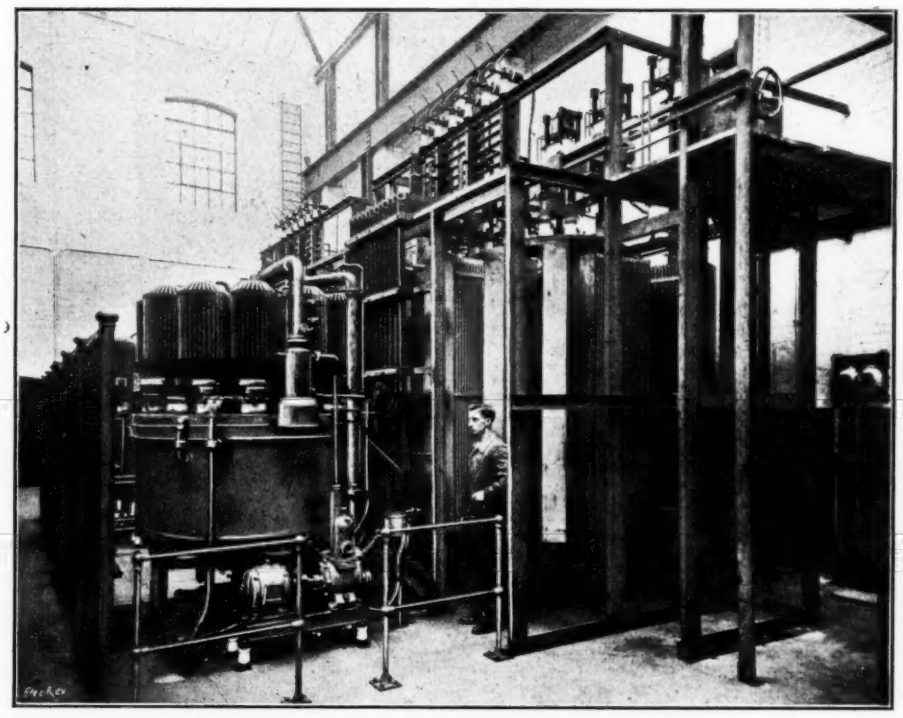


Fig. 2.—Two 3,000-kW Sets at St. Marylebone.

The rectifier proper consists of a large cylindrical arc chamber, at the top of which is mounted the condensing cylinder. At the bottom of the arc chamber is the insulated cathode, while the anodes are mounted round the plate closing in the top of the chamber. Mercury is used to seal the interior from atmosphere, and a small, but very efficient, vacuum pump is used to exhaust the mixture of air and gases. So satisfactory is the sealing that, in general, the vacuum pump operates very little—in some cases a matter of only an hour or two weekly. Frequently, the vacuum pumps are controlled automatically, which ensures that the vacuum in the rectifier is always right, so that load can be applied at any time. The automatic operation is controlled by a special form of vacuum guage with maximum and minimum contacts for the two limit positions. The plant is simple, and the maintenance is claimed to be negligible. The momentary overload capacity is very high, and the rectifiers are insensible to short-circuits.

It is interesting to note that the company can now supply single-unit rectifiers in capacities of from about 200 kW to 5,000 kW.

High-power rectifiers of the type referred to are manufactured with a varying number of anodes, according to the rating; the smallest number is six, and the largest is twenty-four. To utilise the full a.c. wave, the mid-point of the transformer, connected between the incoming supply and the rectifier, is brought out to form the negative pole of the d.c. system, whereby the negative half-waves are reversed.

Vibrationless and silent operation are features of these rectifiers, which enable them to be used in residential areas. The average efficiency is high, and this is especially noticeable at the higher d.c. pressures.

Factory Inspectorate Report.

Extracts from the annual report of H.M. Chief Inspector of Factories and Workshops for 1929, with special reference to accidents of an electrical nature.

(*Concluded from page 257*)

Four accidents were due to the explosion of oil switches on low-voltage circuits. A number of other switch explosions occurred, fortunately not resulting in personal injuries. It is not generally realised that switch explosions are now reportable as "dangerous occurrences," even when no one is injured. Failures of switches and automatic circuit breakers appear to be on the increase and are likely so to continue, not only on electricity supply distribution systems, but also on consumers' premises, owing to the vastly increased power now behind them due to the linking-up of supply systems. Few large consumers know what the capacity of their switchgear really is and few electricity supply authorities are able to tell them what it should be in view of the possible short-circuit conditions obtaining at the particular spot. This is a matter which demands much more careful attention than has hitherto been necessary.

Nineteen prosecutions were taken, mostly arising out of accidents. Six were in respect of electricity supply undertakings (three local authorities and three companies). Twelve were in respect of other factories and one was against a works electrician. Penalties varying from £1 to the maximum of £100 were obtained in thirteen cases, in one costs only, whilst four were dismissed; two appeals were made.

The electrical inspectors have been very fully occupied and some of their most useful work has been accomplished in new plant by preventing the repetition of faults.

As reported last year, many outdoor transforming stations have been put up regardless of the safety of those who subsequently have to operate or maintain them and quite contrary to the requirements of the Regulations. The designers of some appear to have assumed that the Regulations would not apply, nor the question of safety matter at all, just because they are out of doors in the open air, whereas Section 149 (5) of the Factory Act of 1901 expressly provides to the contrary.

A feature of the year has been the return of the metal-clad type of mercury rectifier. The present day patterns embody marked improvements and contracts are in hand for the production of units up to 3,000 kVA each. Whilst those so far installed are of continental manufacture, it is interesting to note that one of the home manufacturing firms has rectifiers in hand for delivery to one of the large electric railway systems.

The making live of the first section of the 132,000-volt national grid system and the change of frequency from 25 to 50 cycles over large areas in Scotland necessitated temporary alterations or additions to e.h.p. switchgear in certain sub-stations, and the arrangements have been the subject of discussion with the authorities concerned as regards the requirements of the Regulations.

Five public supply generating stations in Scotland ceased to generate on taking bulk supplies. In one now supplying a.c. to surrounding districts at 3,000 volts, the new a.c. switchboard was so designed that no work could be done upon it without shutting the station down. Two of the largest private generating plants in the country have been put to work during the year, and several new water power plants for general supply. A factor which is rather perturbing some public supply engineers in the advent of very economical crude-oil engines. Generating costs with these engines are very low and can compete successfully with public supply prices, so much so that in some districts certain factories have discontinued the use of the public supply and installed their own plants. Others, after due consideration, have put in oil engines instead of taking local supplies, which competition is useful, as it promotes progress and development of both systems on an economical basis, to the advantage of industry as a whole.

An investigation into the prevention of fires and explosions due to the ignition of vapours of solvents by static electrical charges in rubber works has shown that a relative humidity of the atmosphere of not less than 50 per cent. appears to provide the desired result.

Amongst the new applications of electricity is that of heating drying cylinders in bleaching works where constant temperatures are required; the cylinders are loaded at 3 kW each, the temperature being thermostatically controlled. The system is stated to be far more satisfactory than steam heating.

The number of sub-stations on the registers at the end of the year in which there is no constant attendance was 14,496.

That section of the general report which deals with dangerous trades records difficulties in maintaining a good standard of compliance with the safety code in many electric accumulator works through the processes being carried on in old and unsuitable premises, and through the work being subject to seasonal fluctuations. The conditions in the larger factories are now generally satisfactory. In some cases precautions against poisoning beyond those required by the Regulations are adopted. In one factory certain classes of workers exposed to lead are periodically transferred to outside work. In another the medical examination is weekly instead of monthly as required by the code and on the slightest symptoms of lead poisoning the worker is transferred to a non-lead, but not generally so highly paid, job till the appointed surgeon permits him to return; that knowledge helps the workers to remember to take that little extra care that prevents ill-effects. Only 23 cases (two fatal) of lead poisoning were reported, against 33 (one fatal) in 1928. The two fatal cases were those of old men of long exposure.

Chromium plating is extending in industry and many trades, and severe cases of chrome ulceration have occurred. The makers of the plant now usually supply means of exhaust ventilation designed to carry off the spray, or fumes, before they reach the breathing level, but several cases have been noted where this was not done before the inspector's visit. Since the end of the year draft Regulations have been prepared to make requirements of this nature generally compulsory.

The manufacture and use of cellulose solutions have been considerably extended and are now carried on in hundreds of factories and workshops in a wide range of trades. The dangers and appropriate precautions have been fully explained in previous reports and in the memorandum published by the department for the guidance of employers. Among the defects noted at the inspectors' visits have been unprotected electrical conductors, switches, lamps, &c., defective storage of inflammable material, and absence of mechanical ventilation.

The introduction of portable spraying apparatus, in which a small electric motor obtaining its current through flexible leads is made up in one unit with the spray pistol, introduces an inherent ignition risk, as the motors are not flame proof and are obviously dangerous. The importers of the apparatus were accordingly interviewed, and after the danger had been pointed out, the design was altered so that the motor was separated from the pistol, and could thus be placed far enough away from the spraying zone to be safe. The toxic risk is, however, present, but it is not intended that these light portable plants of small capacity should be used for extensive work. Under these circumstances it would appear that no special ventilating appliances are necessary during the short time such spraying is done, provided that there are no sources of ignition in the vicinity.

The senior engineering inspector (Mr. Leonard Ward, O.B.E.) suggests that the fact that industrial lighting is receiving more attention may be mainly on account of its economic value, but improvement in lighting has undoubtedly a "personal" factor which is not unimportant. It has been found that there is a general tendency to increase illumination in factories, but the underlying scientific principles are not always observed; the increase is often secured simply by using larger lamps with reflectors of incorrect size and shape, or sometimes without reflectors. Such "uncontrolled" lighting may not only be extravagant, but may also be harmful to the operatives' eyes by reason of glare; it may also increase the liability to accident, due to glare and to the time of eye adaptation required for adjustment between the brightness of the luminant and the work. Hence the use of correctly designed reflectors suitably positioned is of primary importance.

A high standard of both natural and artificial light is now the general rule in all new factories, and the artificial lighting is usually of good design. The importance of preventing glare can hardly be exaggerated. In a typical case the workroom was adequately provided with powerful lamps, but they were covered with small reflectors, which left most of the incandescent filament exposed at about eye level. . . . "The occupier was persuaded to provide much deeper reflectors and was very pleased with the results; the workers were happier, ceased to suffer from headaches and 'bad temper,' and the output during the winter was reported to have increased by 15 to 20 per cent." Cases are reported, too, of bad systems of lighting being the direct cause of accident.

An Automatic Hydro-electric Installation.

A Description of the Tezcapa Power Station of the Mexican Light and Power Co.

AN interesting example of an automatically-operated hydro-electric power station is the Tezcapa electricity works of the Mexican Light & Power Company. This station is situated in a mountainous and lonely region of Puebla, 4,570 ft. above sea level and many miles from the nearest town. The function of the station is to utilise the energy available from a variable water supply to generate electricity for the Necaxa-Noncolco line. Two generating sets are installed, one of 3,800 kW and the other of 1,570 kW capacity, together with automatic control gear by means of which all the operations which would otherwise require skilled attention are carried out. Certain initiating operations, of the simplest nature, are carried out by a peasant attendant who is employed at the station primarily for such duties as keeping the water screens free from obstruction.

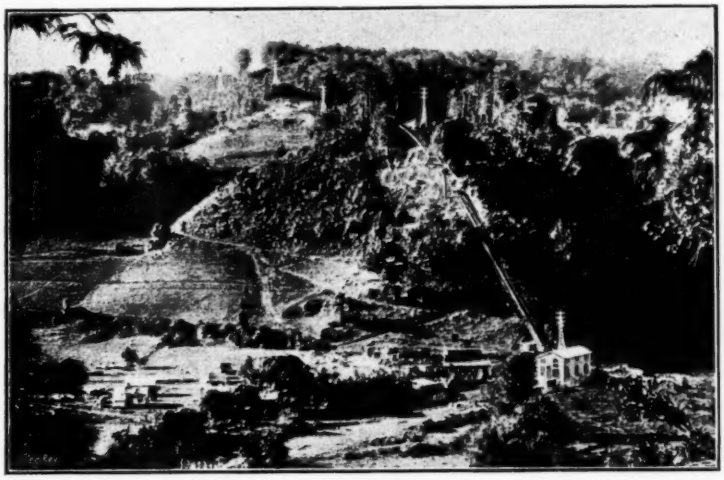


Fig. 1.—Tezcapa Station, showing the Pipe-line and Transmission Line.

Fig. 1 is a view of the site, and gives some impression of the wildness of the country; the pipe-line is seen leading down to the power station, and the river bed is on the right. Fig. 2 is a nearer view of the power house and pipe-line, and fig. 3 shows the 3,800-kW generating set. The water turbines are of Voith manufacture, and were supplied through Messrs. Perrins, Ltd. The turbines operate at 750 r.p.m., and each is directly coupled to the shaft of its alternator. The alternators, which were supplied by the Metropolitan-Vickers Electrical Co., Ltd., are of 4,000-kVA and 1,650-kVA capacity, respectively, and they generate at 4,400 volts, 3 phase, 50 cycles. Both alternators are arranged to operate at constant excitation for all conditions of water supply. In the larger machine amortisseur windings are fitted in the pole tips, which are laminated, to assist self-synchronisation. In the smaller machine the damping effect of the pole tips themselves, which are solid, is sufficient for this purpose. Each generator shaft is strengthened and carries a flywheel, with which hydraulic braking equipment is incorporated.

The output of the sets is stepped up to the transmission pressure of 85,000 V by means of a 6,000-kVA bank of water-cooled transformers. The generators are connected to the primary side of the transformers through M.-V. metal-clad circuit-breakers which are controlled by the automatic equipment. The operating voltage for the relays is derived from a small three-phase control transformer which is connected to the h.p. line, so that the sets cannot be started up by means of the automatic gear unless the line is alive. This prevents the station being connected to a faulty line. The oil-switch and field-switch trip coils and the brake solenoids are operated from a 24-V nickel-iron battery which is supplied with a trickle charge from one of the exciters. When the control transformer is energised the sets can be started up and connected to the line by the attendant closing small control knife switches. The operation having been thus initiated, all the various steps in the process, including the opening of the main gates, running up, paralleling, synchronising, and the closing of the main oil switches are performed automatically.

The immediate effect of closing the control circuit is the starting up of the governor oil-pump motor and the bearing oil-pump motor. When sufficient oil pressure has been obtained, oil-pressure relays close contacts to complete the circuit of an auxiliary contactor whose contacts close the circuit of the main valve-operating solenoid. This effects the opening of the main valve by admitting pressure water to its operating cylinder. As soon as the valve is fully open it completes the circuit of the master contactor, which, in turn, energises the governor solenoid. By this means oil is admitted to the governor cylinder and the turbine gates are gradually opened, so that the set runs up to speed sufficiently slowly to allow the exciter to build up its normal voltage at about 95 per cent. of synchronous speed. At this speed the synchronous-speed contacts of a relay on the generator shaft, operated by centrifugal force, close and complete the circuit of auxiliary contactors, which effects the closure of the machine oil switch, thus connecting the unexcited machine to the line. The fact that this breaker is closed just before the machine reaches its synchronous speed enables the accelerating force of the turbine to assist in pulling the unit into step, while the special amortisseur winding of the larger machine and the solid pole tips of the smaller one further facilitate the synchronising process. An auxiliary contact on the main oil switch closes at the same instant and, after a brief time delay, the main field contactor is closed, thus placing full field on the machine, which then operates under governor control.

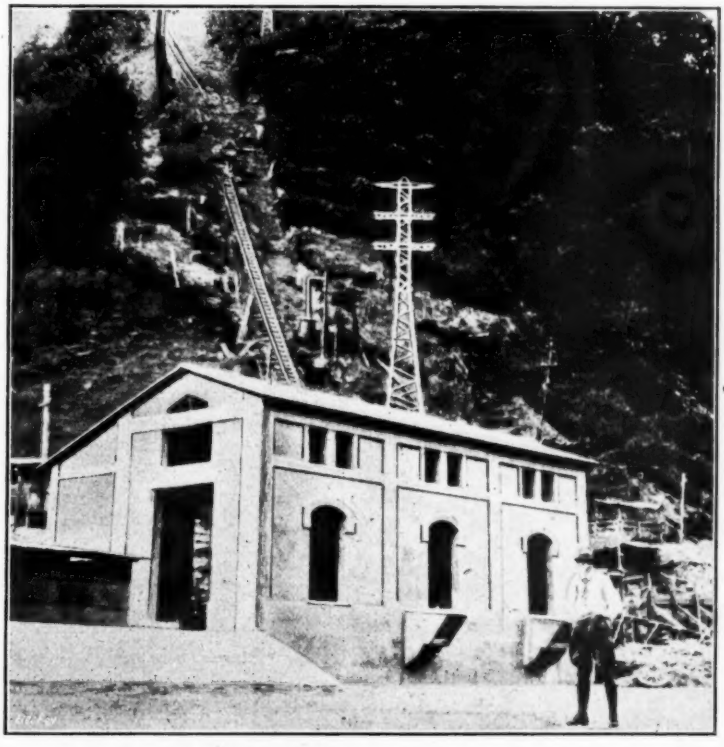


Fig. 2.—The Power Station in Course of Construction.

An interesting feature of the equipment is a system of load

indication devices by means of which the attendant is instructed as to what plant to run, according to the supply of water available. In normal operation the smaller generating set is started up first. Should the amount of water available increase to a value more than sufficient to run No. 1 machine fully loaded, a signal bell and an illuminated signal board warn the attendant that he should start up No. 2 machine, the larger set, and shut down No. 1. Further increase of water supply operates signals warning the attendant to run both machines. Similarly, predetermined values of decreasing water supply result in signals for the amount of plant in operation to be reduced.

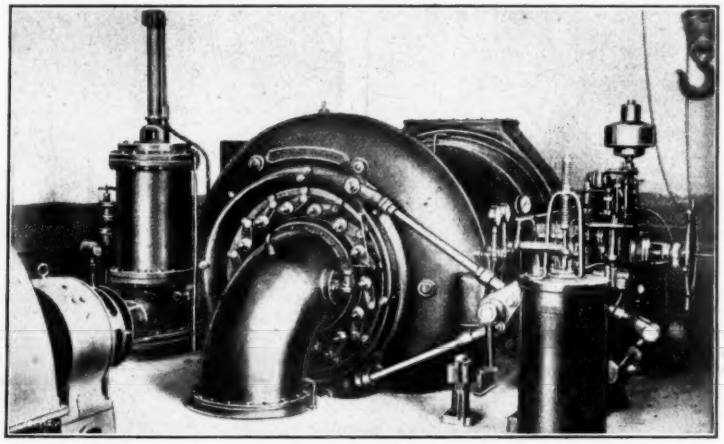


Fig. 3.—The 3,800-kW Generating Set.

The equipment includes complete protective gear which prevents damage to the equipment from faults or other contingencies, the protective relays being so arranged that they either shut down the equipment temporarily or, on the other hand, they lock it out of commission, according to the nature of the irregularity.

In the Tezcapa installation economy in operation has been one of the principal considerations, but in many cases the reliability and efficient operation of automatic gear, which have been amply proved over long periods of service, have been the deciding factors. Among orders which the Metropolitan-Vickers Electrical Company has in hand at the present time are two other interesting installations for the control of unattended hydro-electric generating stations. One of these is for the Maragua Electric Supply Company, of Kenya Colony, East Africa, and the other is for the Mount Lyell Mining and Railway Company of Tasmania.

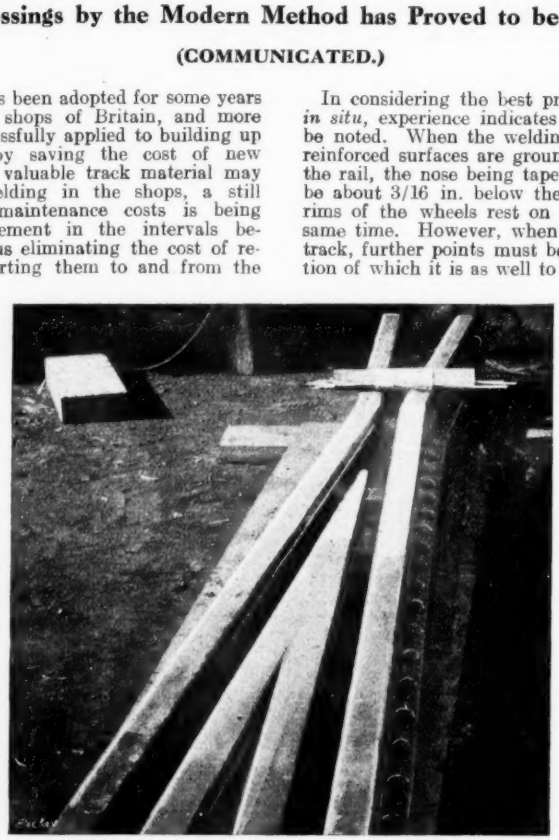
Electrical Rail-track Welding.

Reinforcing Railway Crossings by the Modern Method has Proved to be Particularly Economical.

(COMMUNICATED.)

ELECTRIC welding plant has been adopted for some years in the principal railway shops of Britain, and more recently it has been successfully applied to building up worn railway crossings, thereby saving the cost of new track sections. Although much valuable track material may be salved by reinforcement welding in the shops, a still greater reduction in track-rail maintenance costs is being effected by carrying out reinforcement in the intervals between the passing of trains, thus eliminating the cost of removing worn crossings, transporting them to and from the shops, and replacing them. Further, delay and diversion of traffic necessary during these operations are obviated, and considered by many railroad engineers to be of more consequence than the reduction in cost.

Outside one of the main termini in London, where the suburban service has recently been electrified, are sections of track carrying a ten-minute service of freight and passenger traffic averaging 35 m.p.h., with constant braking and acceleration. The average life of a crossing in this section is four years. Recently, it was decided to try reinforcing these crossings by electric welding, and one of them was removed to the shops for this purpose. This crossing is shown in the accompanying illustration, from which it will be seen that the reinforced surface is perfectly smooth. For this job "Quasi-arc" carbon-steel electrodes were used. Since that time the practice of removing crossings has been abandoned in favour of reinforcement *in situ*, the welder doing the work between the passing of trains. From the experience gained on this track the average overhead cost of repairing a complete crossing is £4, covering electrodes, current, and labour, the last including the welder, grinder, and a look-out. In comparison, the initial cost alone of a new crossing is about £15, and the total cost covering its installation is anything from £25 upwards, according to its position and the traffic conditions. The saving is, of course, increased in proportion in the case of a manganese crossing, the initial cost of which is about £110.



Railway Crossing Reinforced by Quasi-arc Welding.

In considering the best procedure for reinforcing crossings *in situ*, experience indicates that there are several points to be noted. When the welding is carried out in the shops the reinforced surfaces are ground level with the worn surface of the rail, the nose being tapered down to allow for the tip to be about 3/16 in. below the level of the wings, so that the rims of the wheels rest on both the nose and wings at the same time. However, when operations are conducted on the track, further points must be borne in mind in the consideration of which it is as well to remember the following factors: (1) the bearing area of nose and wing rails is less in the throat than in that of the normal rail; (2) a part of the nose is subjected to the traffic on both lines; (3) the wear that takes place between the lower surface of the rail and the chairs, commonly called chair wear, is greater under the nose than under the wings, and allows the tip to depress still further below the level of the wings as a train passes over; this does not apply, of course, to the same extent on those systems where rail sections are employed that permit crossings to be riveted or bolted direct to sole plates without chairs. It will be understood, therefore, that any attempt to make a standard allowance for the difference in the level between the reinforced tip and the wings will be thrown out by the depression of the nose under load wing to chair wear, the extent of which is always uncertain.

Assuming that this wear cannot be taken up by the insertion of packing, it is found advisable to work on the following lines. The relative levels of the tip and wings of a worn crossing are such that the rate of wear is the same on both, or, in other words, they are each carrying their fair proportion of the load as the train passes over. As this is the condition to be aimed at in the repaired crossing, the reinforced surfaces should be ground down to reproduce the same difference in level between the tip and the wings as that which existd in the worn crossing. It should also be noted that care must be taken to chip off all "rag" and cracked or unsound metal in the worn surfaces before welding.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A Radiation Thermostat.

Automatic control of electric *radiators* has hitherto been carried out exclusively by means of air thermostats, which are affected solely by the temperature of the air. Where radiant heat is used, it is necessary, on milder days, to regulate the quantity of *radiation* to the conditions obtaining at any given time, and this cannot be achieved by an instrument which is

Fig. 1.—" Morganite " Radiation Thermostat.

insensitive to radiant heat. In order to overcome this difficulty, The Morgan Crucible Co., Ltd., Battersea Works, Church Road, S.W.11, has introduced the " Morganite " radiation thermostat which, it is claimed, differs from all other instruments in that it is based on the rate of heat loss from a *heated* body, which thus behaves in precisely the same manner as the human body. This *heated* body consists of a black copper sphere which, provided the surrounding conditions are such as to comply with the required conditions of comfort, when heated internally by a small input of 3 to 10 watts, will be held at the same temperature as one's clothes. The sensitivity of this instrument and the rate of change of temperature of " Morganite " electric radiators are carefully adjusted to enable the thermostat to regulate the radiation to the conditions obtaining at any given moment. The equipment consists of the thermostat proper, fig. 1, and one or more relays, fig. 2. The latter are constructed to carry currents of 10, 20, 30, 40, and 50 A, a.c. or d.c.

The relay consists of a mercury tube switch rocked by means of two solenoids. The circuits of the latter are so arranged

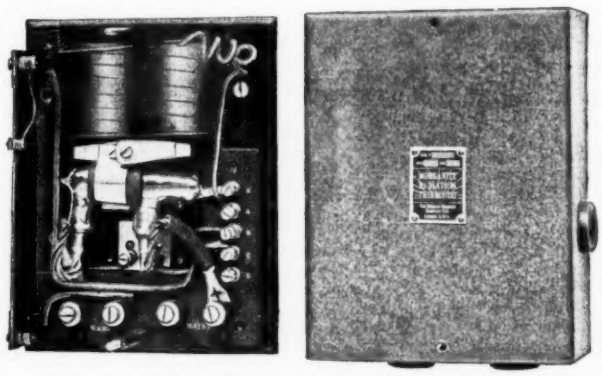


Fig. 2.—Master Relay for Radiation Thermostat.

that current can only flow during the momentary period of action. In all cases, one master relay containing a comfort coil is required with each thermostat, and where additional relays are required sectional relays, without comfort coils, may be used. For various classes of buildings the amount of heat necessary to maintain the state of comfort varies, and a comfort coil in the master relay is specially designed to control the amount of heat according to the type of building in which it is employed. Adjustment can be readily accomplished by changing the comfort coil. The thermostat should be placed in such a position that it is subjected to the same conditions as the occupants of the room.

The thermostat is provided with a flexible lead connected to a special 4-pin plug, the socket for which is fixed to the wall or elsewhere. The relay(s) may be placed in any convenient position. The current carried by the control wiring does not exceed the equivalent of 10 watts at the full line voltage. A cut-out is incorporated in the thermostat, which breaks the circuit of the heating coil of the sphere when the air temperature exceeds a certain value. The special 4-pin plug is so constructed that, if withdrawn, the relays are switched off and cannot operate again until the plug is replaced.

A Wire-covering Machine.

The accompanying illustration, fig. 3, depicts style M, one of a range of wire-covering machines produced by Stott's Wire-covering Machines, Ltd., 323, Bolton Road, Pendleton, Manchester. It is designed for double-covering medium-size

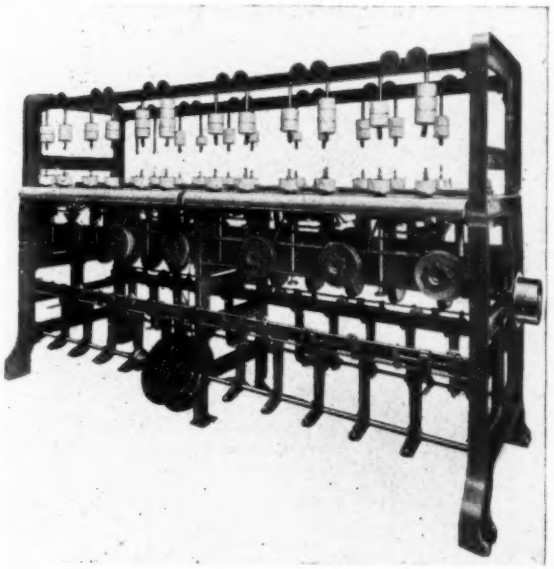


Fig. 3.—" Stotts " Style M Wire-covering Machine.

wire and heavy flexible cores with cotton on silk, and comprises one gang of twelve " d.c. units," six on each side. It occupies a floor space of 11 ft. 3 in. by 3 ft. 9 in. The following are claimed as special features for this and other machines of this make:—All shafts have ball bearings or self-oiling bushes; all high-speed parts are most carefully balanced and tested at high speed; silent gear drive to covering heads; three sizes of interchangeable covering heads, suitable for speeds from 3,400 to 4,200 r.p.m.; patent fliers ensure perfect spreading of the cotton with minimum " mils increase "; automatic tension ensures equal tension from start to finish of a supply " cheese "; patent micrometer lay adjustment permits of minute adjustments of the lay by simply turning the hand wheel—this ensures maximum covering value from cotton, with minimum cotton costs and perfectly smooth coverings; each " unit " is entirely independent and can be started or adjusted at will; self-adjusting traverse drive gives constant traverse ratio for wire take-up drums; all parts are machined to fine limits to ensure full interchangeability.

A Cellulose Acetate Cable Varnish.

An insulating varnish for coating cables has been developed by the Acetate Products Corporation, Ltd., Pontifex House, Shoe Lane, E.C.4, which is claimed to be superior to other varnishes in plasticity, dielectric strength, covering power, glossy finish, and in resistance to water and acids. It is also stated that the varnish shows no sign of fracture when the cable which it covers is twisted to any extent. It is air-drying and can be supplied either transparent or in any pigmented colour.

The History of the G.E.C.

Mr. A. Gowans Whyte's account of the company's remarkable progress.

FROM its title it will be evident to all acquainted with the G.E.C. that Mr. Gowans Whyte's book* is practically a biography of Sir Hugo Hirst, Bt., for it would be impossible to think separately of the company and its chairman. The word "romance" in connection with industrial leaders has been cruelly overworked, but the history of the G.E.C. fully justifies its application to Sir Hugo Hirst's career. The story commences in 1886 when Mr. Hugo Hirst joined Mr. Gustav Byng and commenced to emancipate electricity from its scientific handicaps. Mr. Byng's dealings were confined to electric bells, telephones and other examples of early electrical apparatus, but in 1887 the General Electric Apparatus Co. published a catalogue in which practically everything electrical (as then existing) was listed. Moreover, service of a comprehensive nature was offered to clients. These two characteristics have thus been possessed by the G.E.C. from its inception. Even water heaters were available from stock in those early days! It was Mr. Hirst's policy to discover exactly what electricity users required and then proceed to find means of meeting these requirements. In this way the firm attached to itself a number of small manufacturing concerns which produced for stock, and it is worthy of mention that this led to the establishment of standards some of which still persist. The foundations of the company's enormous export trade were laid at the same time, for agents and shippers who knew little of the requirements were glad to find a firm who gave "service" and advice. To this research was added, so that it can be claimed that the organisation of the modern G.E.C. is but that of 1887 of a larger growth. The limited company was formed in 1900 and it had a total issued share and loan capital of £700,000. In its first complete year it made a trading profit of £67,656 and paid an ordinary dividend of 10 per cent. At the close of the 1929-30 period the issued capital stood at well over £8,000,000, and for that year the trading, &c., profit was £1,179,000, an ordinary dividend of 10 per cent. being paid, with a bonus of 4 per cent.

The Witton works was planned in 1900 and by 1904 the engineering works and foundry were in full commission. The next important development was the introduction of the tungsten filament lamp. "Introduction" is a mild word for Mr. Gowans Whyte shows that the new source of illumination had to be practically forced upon the conservative users of carbon lamps. The company was so far successful, however, as to be able to commence the large-scale manufacture of "Osram" lamps at Hammersmith alongside the existing Robertson lamp works. For many years this branch of the company's activities has been one of the most prosperous, and it remains so to-day. During the first decade the G.E.C. had gradually written down various items to the extent of £186,000 and accumulated a reserve of over £200,000. In 1910 the goodwill and patents valued at £90,000 were written down to £1, and in spite of the company's subsequent enormous expansion they still stand at that nominal figure. When the telephone service was taken over by the State the company set out to satisfy future requirements for the equipment which up to then had been imported. This led to the establishment of the Peel-Conner Telephone Works, Ltd. A year or two before the war the company, in association with Pirelli's, of Milan, decided to enter the cable-making business; this enterprise was delayed by the war, and it was not until afterwards that the Pirelli-General works at Southampton was completed. It is obvious that these multifarious activities could not be effectively supervised by one man, and it was in the delegation of this work and responsibility that Sir Hugo's genius manifested itself. By choosing the right men and giving them complete authority in their various departments, subject to the general guidance (by close contact) of the head of the concern, the company's different works continued, and still continue, to expand and prosper. Finance and sales have remained the concern of the central organisation and thus the many departments have been co-ordinated. More than that, the system has allowed each branch to develop naturally, according to the conditions prevailing in that particular direction, guarding against the rigidity which follows a strict central control of matters which are essentially departmental. This policy has been extended to the export business for which subsidiary companies have been formed. After training in the methods of the company men have been sent abroad with a considerable amount of freedom and responsibility. The success of this policy has been amply demonstrated.

An interesting chapter of the book is that dealing with the company's services to the country during the war. In this direction the carbon factory was pre-eminent, and the company's early, costly, and patriotic operations in this connection make a story in themselves, as reported in past volumes of the ELECTRICAL REVIEW. This was one example of the prevision of the company, and was of considerable value when foreign supplies were suddenly cut off in 1914. In addition to carrying on its production of essential electrical supplies, the company undertook the manufacture of many other war-time necessities with remarkable efficiency and speed.

After the war the company made a very rapid advance. In the 1919-20 period the capital was increased by £2,000,000 and important acquisitions were made—such as the Fraser and Chalmers' turbine works and Chamberlain & Hookham's meter works; the Wembley glass works was erected; the Osram-Robertson lamp works was extended; and a large factory was put up alongside the Conner works at Coventry for the production of telephone plant and ebonite. It was in 1921 that the company moved from its unsuitable premises in Queen Victoria Street to the splendid "Magnet House," Kingsway. The year 1925 marked a complete recovery from post-war troubles, and with the exception of the General Strike year (1926) the company's progress has continued. It was in 1925 that Sir Hugo received his baronetcy. Sir Hugo's efforts to maintain the control of the company in British hands are touched upon, and attention is given to the human and personal side of the G.E.C. From the start the employés have been recognised as human beings and much has been done to provide for their present and future welfare. The three pensions and benevolent funds of the company stood at £561,718 at the date of writing; and the clubs and recreational facilities are of a very extensive character. In the final chapter there appear brief sketches of the careers of some of the directors of the company, most of whom have "risen from the ranks."

The illustrations include portraits of Sir Hugo Hirst, Bt., Mr. G. Byng, and Mr. M. J. Railing, and a number of interesting pictures of early G.E.C. apparatus.

The company was fortunate in its choice of a historian, for Mr. Gowans Whyte is not only thoroughly acquainted with the electrical industry, but can also tell its story in a very readable way.

* "Forty Years of Electrical Progress: The Story of the G.E.C.," by Adam Gowans Whyte, B.Sc. (166 pp., ill.). London: Ernest Benn, Ltd. Price 5s. net.

Reviews.

Alternating-current Bridge Methods. By B. HAGUE, D.Sc. Second Edition. Pp. xv+391; figs. 112. London: Sir Isaac Pitman & Sons, Ltd. Price, 15s. net.

The importance of bridge methods of alternating-current testing has greatly increased since the appearance of the original edition of Dr. Hague's treatise. These methods, till recently practically confined to the research and testing laboratories, are now employed in the industrial field for the measurement of dielectric losses of high-pressure cables, and of losses in apparatus carrying heavy alternating currents. The appearance of a second edition of a work dealing with so important a branch of a.c. technology, from the pen of so authoritative a writer as Dr. Hague, is therefore very welcome.

The present edition is not a merely superficially revised issue of the earlier work, but contains a large amount of new matter, and it may be of interest to the general reader briefly to indicate the scope of the book as it now stands. The first chapter deals with fundamental principles of capacity and inductance, and with the elementary theory of bridge methods of a.c. measurements. Chapter II is devoted to an exposition of the symbolic method for the calculation of a.c. circuits, with particular reference to bridge circuits. This chapter, in itself, is a most valuable text-book on a.c. theory, and the author's teaching experience has rendered him peculiarly competent to present the theory of the symbolic method with great clearness. In this chapter the treatment originally presented in the earlier edition has been revised and amplified, greater prominence being given to the use of circuit transformations.

The third chapter deals with apparatus used in conjunction with a.c. bridge methods, and contains full descriptions of modern standards of resistance, capacitance, and self and mutual inductance. Sources of alternating current for testing and various types of detectors are also given full treatment, both descriptively and theoretically. Chapter IV deals in detail with the many bridge networks which have found practical use, and here the author has incorporated the industrial applications of these networks to which reference has been made. The final chapter is entitled "On the choice of a bridge method and the precautions to be observed when using it," and the title sufficiently indicates the scope of the chapter. Here the author has incorporated new matter relating to the problems of earthing and shielding bridge networks.

The book is furnished with a copious index, and a list of other works dealing with bridge methods, for the use of those wishing to pursue their reading in this subject. Throughout the text there are numerous references to original papers. The illustrations are excellent, and the uses of the various bridge circuits are rendered additionally clear by the many examples of actual experimental results and of the calculations arising out of them. It is hardly necessary to say that a fair knowledge of mathematics is requisite for an intelligent reading of a book of the kind under review. We extend to Dr. Hague our hearty congratulations on this new edition of his important work. Both as a handbook for the practical worker and as a theoretical book of reference, it is deserving of the highest praise.

Electrical Wiring and Contracting. Edited by H. MARRYAT Vols. III to VII. Pp. 515 to 1808. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. each volume.

Volumes I and II of this series of well printed and fully illustrated handbooks have been reviewed in these columns. The publication of the entire set of seven volumes has now been completed.

Volume III is devoted to "Practical Wiring Work," "Switching," and "Primary and Secondary Cells." The important subject of wiring is by the experienced pen of Mr. F. C. Raphael who deals with the primary principles of, and describes the varied systems in common use for, the wiring of buildings. Mr. F. W. Andrews writes a fitting supplement on the varied types and functions of the branch switches employed in wiring. Mr. W. S. Ibbetson begins with early patterns of primary batteries, explains the chemical action in cells, and leads on to details of modern batteries of accumulators. Tests for batteries and the treatment of faulty cells are clearly described.

Volume IV opens with "Motor Starters and Regulators" by Mr. H. Cotton, and their construction and design, and application to d.c. and a.c. machines are dealt with. The same author also writes on "Private Power Plant" and confines the subject mostly to small petrol- and paraffin-engine sets. A brief reference to water power might have been usefully included. The construction and maintenance of "Electric Signs" are described by Mr. G. A. Wedge, and the special points to be observed for success in this growing branch of electrical and advertising work are emphasised. Mr. H. R. Taunton is entrusted with the vital subject of "Estimating," and he gives valuable and original hints which, if acted on, would check the evil of undercutting.

Volume V deals with "Heating and Cooking," "Converting Plant," and "Electric Bell, Alarm and Clock Systems," written, respectively, by Messrs. J. F. Stanley, P. Kemp and J. F. Corrigan.

In the first section the electrical means of heating water for domestic purposes are described at some length, and useful information is given regarding large and small cookers and ovens. Mr. Kemp's section on "Converting Plant" treats of the use and control of transformers, rotary convertors, and rectifiers of various types, and their varied characteristics are explained with the minimum of algebraical expressions. Mr. Corrigan's section is comprehensive and thoroughly practical, although, owing to the growing use of small transformers in place of batteries, more space might perhaps have been devoted to the proper installation of these and their varied applications.

Volume VI is concerned with "Lifts," "Lamps" and "Telephones." A specially useful part of the section on lifts by Mr. L. S. Atkinson is that devoted to the tracing and correction of mechanical and electrical faults. Mr. J. S. Dow finds much that is novel and interesting to explain in the somewhat of late hackneyed subject of "Lamps and Illumination." Mr. T. Sherratt deals very thoroughly with telephone principles and the choice of apparatus for domestic and business purposes. The linesman will appreciate the hints given for the localisation of faults.

Volume VII is the last and one of the most bulky in the series. In it Mr. H. V. Gibbons deals with "Radio Installations," Mr. F. W. Shilstone with "Industrial Installations," and Mr. C. R. Bates with "Theatre and Cinema Installations." The reader will find much that is valuable in all three sections, but the majority of those engaged in general contracting work will benefit more by detailed study of the Industrial Section, the other sections with the data they contain being convenient for reference when special installations are called for.

The editor and authors of these practical volumes are to be congratulated on the completion of a series which must prove of benefit to the contracting industry.

D.S.M.

Autobiographical and Other Writings. By ALAN A. CAMPBELL SWINTON, F.R.S., M.Inst.C.E., M.I.E.E. Pp. xi+181; illustrated. London: Longmans, Green and Co. Price 10s. 6d. net.

Alan A. Campbell Swinton passed away this year on February 19th, while this book was being printed. Particulars of his career were given in the obituary notice published in the ELECTRICAL REVIEW of February 28th, but this account, though recording the principal events of his life with some completeness, by no means exhausted the possibilities of interest for electrical engineers in the work and views of one whose scientific leanings and intellectual attainments had brought him into touch with the dominating personalities in the world of physics and engineering, as well as with practically all phases of electrical progress.

In these pages we have glimpses of such men as Lord Kelvin, Lord Armstrong, Professor T. H. Huxley, Sir Charles Parsons, Sir William Crookes, Sir William Ramsay, and David Hughes, whose note-books on and experimental apparatus for wireless telegraphy were saved for the nation through the instrumentality of the author. Campbell Swinton will perhaps be best remembered for his work in "light-current" electrical engineering, but a chapter that will appeal especially to those engaged on the "heavy" side is that dealing with the early days of electricity supply, which contains many amusing sidelights on the state of art when "the" electric light was first introduced. Thus, fuses (originally introduced by Sir Joseph Swan) were designed (and arranged) not to protect the wires against overload, but to save the fragile and costly lamps from the effect of large variations in voltage. Again, before the idea of three-wire distribution and high-voltage transmission had been developed, it was thought by one eminent pioneer, at least, that in a densely populated area one power station would be necessary for every quarter of a square mile.

In the chapter entitled "Progress and Promise" some fascinating speculations are put forward, though without any very definite pronouncements as to the views held by the author. One such suggestion is that living matter may be not always subject to the second law of thermo-dynamics—a view which, if established, would have consequences at which we can only dimly guess.

Campbell Swinton was by nature an individualist, though he developed an aptitude for working with others. His school-days were not happy, as the restrictions imposed by regulations designed for the normal adolescent were not of a kind to encourage early intimations of scientific genius. Their net effect, however, would appear to have been the intensification of his independence of outlook and of his belief in the importance of science in making for the happiness of mankind. He insisted upon the leading part played by scientists in this connection, as compared with politicians or soldiers, on the ground that the former gave the world true riches, not by a process of transfer and exchange, but by the actual creation of wealth.

A Study of the Induction Motor. By F. T. CHAPMAN. Pp. xvi+289; figs. 199. London: Chapman & Hall, Ltd. Price 21s. net.

One may perhaps have been forgiven for thinking, prior to the appearance of Dr. Chapman's book, that so much had been written on the theory and practice of the induction motor as to render any further volume somewhat superfluous and to result in merely rearranged repetition. In the work under consideration the author has shown us, however, that what we had regarded as a distinctly hackneyed subject is still capable of intensely interesting treatment in the hands of a master of the subject. "It is when working within limits that the master reveals himself," and the present volume is a remarkable demonstration of that dictum. In this book the author has drawn upon a wide experience and an intimate knowledge of induction machines, confining himself, in twenty chapters, to the fundamental theories of induction-motor design as instanced by the following chapter headings:—

Introduction, dealing with the rotating field, total inductance and reactance, armature flux and armature current circle diagram; motor with an infinite number of phases; graphical theory, mechanical construction; windings; total inductance of a winding; harmonic analysis of the air-gap field; the squirrel-cage rotor and its fields; reactions between stator and rotor circuits; single-phase induction motor; the synchronous induction motor; the squirrel-cage motor; multi-speed induction motors; motors in cascade; the Hunt motor; starting of induction motors; the magnetic circuit; effects of saturation and of flux pulsation; practical calculations; and finally the experimental determination of the current circle.

The study embraces machines having wound and squirrel-cage rotors, but a.c. commutator motors are excluded. The author devotes special attention to the harmonic analysis of the air-gap field, and a new definition of the winding dispersion coefficients is derived from the conclusion that only the fundamental air-gap field is of any practical importance in the transfer of power across the air gap under normal circumstances.

The sum total result of the study is a book which we are convinced will prove of inestimable value to machine designers, and which we think will in a short space of time become a standard work of reference. The mathematics involved are of the simplest character and should offer no obstacle, to advanced students, to a full appreciation of the work.

We cannot refrain from a special comment upon the excellence of production of the book. The present year is the publisher's centenary year, and if the volume under review be any criterion, it would seem that they are celebrating it in no uncertain manner. Printing, illustrations, wide margins, and quality of paper combine to produce a book of high artistic merit, and one which is an ornament to the engineer's bookshelves.

The Conductivity of Solutions and the Modern Dissociation Theory. By CECIL W. DAVIES. Pp. viii+204. London: Chapman & Hall, Ltd. 1930. Price 15s. net.

Forty years ago the study of the electrical conductivity of solutions received great impetus from Arrhenius's theory that the molecules of the electrolyte are already present to a large extent in the form of ready-made ions; but imperfections in the concordance between theory and experiment have led in recent years to the conclusion that the molecules of a salt are ionised completely, both in solution and in the solid state. The keynote of the present volume is found in a statement in the preface to the effect that "the success of the more recent theory caused opinion to turn too far from the original view of Arrhenius, but it is now becoming recognised that the

interionic attraction theory supplements, but does not replace, the older dissociation theory." With the help of the clues provided by the older and newer theories, Mr. Davies has been able to interpret the conductivities of solutions with a precision and thoroughness that was impossible hitherto. For this reason his book will certainly replace the earlier texts, except so far as they were concerned with experimental methods and results, and is likely to enjoy a long period of useful life in view of the strength and apparent finality of the position which he has taken up.

Electrical Housecraft. By R. W. Kennedy. Pp. x+108; figs. 57. London: Sir Isaac Pitman & Sons, Ltd. Price 2s. 6d. net.

In supplying a "simple guide to the proper care, use, and understanding of electrical apparatus," in addition to an understanding of "the limitations of electricity as well as its possibilities," this book should prove of much value to non-technical users of electricity for domestic purposes, particularly those who are anxious to do their own "small repairs." Such subjects as simple circuits, switches and fuses, lighting, heating, cooking, and so on, are dealt with in separate chapters, laying down simple guiding principles with simple explanations designed to remove the sense of mystery which often proves a deterrent to the use of electricity in the home. Two chapters in particular, we think, are of great importance and will be of much service to all sections of the industry, as well as to the consumer. We refer to Chapter 9, which deals with tariffs and costs, making it clear to the consumer why he should pay more for the electricity he uses for one purpose than that he uses for another purpose, and Chapter 15, in which the author deals with the safety question and shows the consumer or user that his job is to avoid making himself a "good earth." The book is interestingly written and well illustrated. The advantages of electricity are kept well to the front throughout, and if the price of the book were lower we think that it would probably be accepted by many supply engineers as a useful propaganda medium. As in every other book there are "points of difference": for instance, in the introductory chapter we feel that the question of the replacement of domestic servants by electricity is overstressed; the great field for domestic electricity supply is in the servantless home, to which the supply industry is looking and will look more and more for the ever-increasing domestic load, and where the great advantages of electricity as a benefactor to mankind are being chiefly felt. Again, we can hardly believe that "at the present day *all* electric kettles are provided with automatic devices to switch off the current if the kettle is allowed to boil dry."

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Interference with Radio Reception.

With reference to my letter published in the Electrical Review for July 18th, an incident has come to my knowledge which shows what I may term the public-spirited way in which some firms deal with interference which may be caused by apparatus of their make. I cannot do better than give you an extract from a letter received from Messrs. J. & E. Hall, Ltd., makers of refrigerating machinery, &c.:—

"We have had on other occasions similar complaints, and to overcome the trouble have fitted a condenser across the motor armature. This unit we have obtained from the Dubilier Condenser Company, which supplies a condenser mounted in a cast-iron case specially designed for this purpose. We are ordering one immediately for earliest possible delivery consigned to your address, and we shall take it as a favour if you will arrange to have it fitted in circuit on our behalf."

I am sure if this spirit were universal a good deal of the avoidable interference would be eliminated.

James Nelson.

London, W.C.2, *August 17th*, 1930.

Rural Electrification.

In your issue of July 25th an article by Mr. H. C. Woolaston appears in which he outlines some of the difficulties the landowner is faced with in connection with electrification of rural areas. It would appear that Mr. Woolaston has overlooked the facilities offered by the Lands Improvement Company in this connection, for schemes approved by the Ministry of Agriculture. I took some trouble a few years ago to get the point of advances for the purchase of electrical apparatus cleared up. They can be dealt with on a fifteen-year loan basis.

This company, which was incorporated by special Acts of Parliament, was formed for the purpose of assisting landowners to improve their properties. Advances are made by the company for such agricultural and general improvements as are sanctioned by the Ministry of Agriculture, including the provision of electric light and power. I would suggest that Mr. Woolaston and many other landowners who find themselves faced with similar problems might do well to investigate the advantages of utilising the services of this company, chief of which are: the procedure is simple; there is no demand for investigation of title or deposit of deeds; the outlay is charged on the property improved and repaid by way of an annuity spread over a fixed period not exceeding forty years. Where improvements are carried by the landlord for the benefit of tenants the usual course is for the landlord to carry out the improvements, the tenant undertaking to pay as additional rent the annual charge created by the loan, such charge to cover repayment of capital and interest.

R. Borlase Matthews.

East Grinstead, *August 12th*, 1930.

The Design of Bus-bars and Connections.

With reference to the article which appeared in your issue of the 8th inst., may I make a few suggestions?

The formula for the forces between bus-bars as given by Mr. H. E. Hutter appears to apply only to the normal working of the system. As the maximum stresses are set up during short circuit, I suggest the following formula will give a result more in keeping with the forces which are likely to occur—

$$F=\frac{32.4\ I^2}{d\times 10^7}$$

where F=max. force between the bars (3-phase with the bars in the same plane) in lb. per ft. run, I=maximum short-circuit current calculated from the reactance in the circuit, and d=the spacing in inches (between centres).

This formula may give results which are a little high, as allowance is made for complete "doubling," and the latter is a debatable question. In any case, it is safer to be on the high side in stress calculations.

Concerning the arrangement of the bus-bars on the supports, that shown in fig. 3 (a), while strong so far as deflection of the copper is concerned, is unsuitable for heavy currents, owing to lack of adequate ventilation. I submit that a better scheme is to arrange the bars as in fig. 3 (b), with the bus-bar supports fixed every 3 ft. (approx.)—depending upon the calculated stresses—and mid-way between the supports to place spacing pieces of hardwood between the bars of the same phase and bind the whole phase together with braid or other suitable material. It is found in practice that this adds greatly to the stiffness of the bus-bars and reduces the risk of deflection.

D. Rex Eastwood.

Manchester, *August 8th*, 1930.

Electricity v. Gas for Heating.

The following simple rule (which, I believe, is original) gives the cost per kWh at which electricity must be supplied to give the same amount of heat as that given by the combustion of gas:—"Divide the cost per therm of gas by 30."

Thus, if gas is supplied at a charge of 13.4d. per therm (this is the price charged by our local gas company), then 13.4d.÷30=.45d., or rather less than ½d. That is to say, electricity must be priced at rather less than ½d. per kWh if it is to compete with gas for heating purposes.

H. R. Kempe.

Betchworth, *August 16th*, 1930.

A Meter Problem.

I must thank Messrs. A. C. Harvey and N. W. Jones for their kind endeavours to assist me in solving the meter problem.

I fear I have not made the point of my query quite as clear as I might have done, for I omitted to state that after the meter disk has completed its revolution it stops, the fan of course still running.

In reply to Mr. Harvey I would say that the fan is of the non-oscillating pattern. Referring to the point raised by Mr. Jones as to intermittent contact, I have satisfied myself that all is O.K. in this connection. Perhaps I used a bad illustration when I referred to the alternator, but the effect in any case would compare with a machine being out of step at paralleling, and this was what I meant to convey; it is not a hunting effect.

Since originating this query I have made further tests with exactly the same result, but I now notice that, after the disk has made this little spurt of speed prior to stopping, the disk appears to move slightly in the reverse direction and seems to settle down in a definite position.

J. W. Cooper.

London, N.15, *August 18th*, 1930.

Criticism from Overseas.

I should like to refer to a paragraph appearing in your distinguished paper on the 1st inst., under the above title, commenting on a complaint from one of your Indian readers.

As to the haphazard letter sent by the advertiser in reply to an inquiry coming from a potential customer in India, one feels inclined to think that the reply was drafted by a young, incompetent fellow who had not yet got hold of the rudiments of either correspondence or salesmanship.

But what of the "responsible person" who signed that letter? He cannot possibly have appreciated the importance of an overseas inquiry, or else he would have rejected that exceedingly poor product of his correspondence department.

Be that as it may, one thing is sure. The Indian firm is not likely to send another inquiry to the "advertiser," but will look out for some other suppliers who will not necessarily be British.

The cause of the decline of our export trade lies to a large extent at home.

Roderick Hedley.

London, S.E., *August 12th*, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1928.

25,709. "Electric ship-propulsion systems." British Thomson-Houston Co., Ltd., and G. O. Watson. July 6th, 1929. (332,418.)

1929.

2,209. "Arrangement for limited power transmission in electric networks." Siemens-Schuckertwerke Akt. Ges. January 24th, 1928. (304,693.)

2,401. "Modulation of a beam of light, for use, for example, in the recording of sound or in the reproduction of recorded sound." J. R. Robertson and J. Vielle. January 23rd, 1929. (332,567.)

2,750. "Electric battery-charging systems." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). January 26th, 1929. (332,621.)

7,828. "Apparatus for magnification and direction of sound, as applied to gramophones, wireless loud-speakers, or any instrument in which sound waves are transmitted." S. R. Warren. May 13th, 1929. (332,648.)

8,935. "Electromagnetic relays." C. B. Bartley and V. H. Dake. March 19th, 1928. (308,227.)

9,177. "Manufacture of insulating material." International General Electric Co., Inc. March 21st, 1928. (308,315.)

9,350. "Vacuum switches." British Thomson-Houston Co., Ltd. March 23rd, 1928. (308,611.)

11,225. "Manufacture of electrically insulating materials." International General Electric Co., Inc. April 11th, 1928. (309,507.)

11,784. "Electric relays." L. H. Peter, E. W. Challans, R. M. MacGregor, and Westinghouse Brake and Saxby Signal Co., Ltd. April 16th, 1929. (332,534.)

12,200. "Electric protective arrangements." A. Reyrolle & Co., Ltd., R. W. Biles, and E. W. M. Scott. April 19th, 1929. (Cognate application, 39,733/29.) (332,539.)

12,293. "Electric wiring or like clip or carrier." T. Hartley. April 20th, 1929. (332,550.)

12,304. "Control of wireless apparatus." L. H. Pearson and W. J. Randall. April 20th, 1929. (332,572.)

12,366. "Compensating arrangements for electrical induction disk devices." British Thomson-Houston Co., Ltd. April 24th, 1928. (310,378.)

12,467. "Method of, and means for, telegraphic transmission of pictures and the like." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 22nd, 1929. (332,559.)

12,476. "Submarine communication conductors." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). April 22nd, 1929. (332,573.)

12,610. "Combined voltage-regulators and circuit-controllers for dynamo-electric machines." A. E. White (Owen Dyneto Corporation). April 23rd, 1929. (332,592.)

12,880. "Tubular swivel connections for electric light and similar fittings." H. F. Dugdill and D. Dugdill. April 25th, 1929. (332,614.)

13,820. "Method of producing and maintaining constant the necessary supply of phosphoric acid in the electrolyte of lead accumulators." Dr. M. Kugel. May 3rd, 1929. (Addition to 280,197.) (332,660.)

13,974. "Acoustic direction-determining device." Electroacoustic Ges. August 4th, 1928. (316,863.)

14,222. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 16th, 1928. (313,594.)

14,537. "Arrangements for feeding discharge-tube cathodes with alternating current." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 9th, 1929. (332,667.)

15,302. "Leads or connections for electrical instruments." A. G. Sant. May 16th, 1929. (Patent of addition not granted.) (332,671.)

15,517. "Acoustic direction-determining device." Electroacoustic Ges. September 8th, 1928. (Addition to 316,863.) (318,608.)

16,094. "Sound-reproduction by optical means." H. J. Kuchenmeister. May 24th, 1929. (332,679.)

16,435. "Photo-electric cells for reproducing sound from films." British Thomson-Houston Co., Ltd., and G. S. C. Lucas. May 28th, 1929. (332,684.)

16,644. "Electric signalling systems." Standard Telephones and Cables, Ltd. February 5th, 1929. (332,687.)

16,732. "Announcing apparatus." Speciality Sales, Ltd. (Begesa Deutsche Ges. Elektrische Spezial-Apparate). May 30th, 1929. (332,688.)

16,823. "Method of starting small electric motors." Siemens-Schuckertwerke Akt. Ges. June 2nd, 1928. (312,928.)

16,877. "Telephone instruments." Mullard Radio Valve Co., Ltd., and C. F. M. Hayes. May 31st, 1929. (Addition to 308,448.) (332,689)

17,437. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., D. H. Graham, and H. J. Taylor. June 6th, 1929. (332,691.)

18,029. "Cathodes for electric discharge tubes." M-O Valve Co., Ltd., and D. A. Rankin. June 12th, 1929. (332,695.)

18,423. "Thermostatic electric switches and similar automatic electric switching devices." M. Payne. June 14th, 1929. (332,698.)

18,806. "Thermostatic controlling means for electric ovens and like utensils." N. Dennes and Associated Electrical Industries, Ltd. June 19th, 1929. (332,703.)

19,251. "Regulating systems for dynamo-electric machines." Associated Electrical Industries, Ltd. June 29th, 1928. (314,531.)

19,344. "Combined electric lighting and heating apparatus." L. G. Hawkins and L. G. Hawkins & Co., Ltd. June 24th, 1929. (332,709.)

19,613. "Vacuum electric tube devices." Westinghouse Lamp Co. June 26th, 1928. (314,395.)

19,766. "Luminous electric discharge tubes." G. Claude. August 30th, 1928. (318,198.)

20,155. "Control of alternating and/or pulsating currents in electrical circuits." Siemens Bros. & Co., Ltd., D. A. Christian, and E. W. Palmer. July 1st, 1929. (332,716.)

20,185 "Thermionic amplifiers." Kolster-Brandes, Ltd., and W. S. Percival. July 1st, 1929. (332,717.)

20,557. "Photo-electric discharge devices." Telefunken Ges. für Drahtlose Telegraphie. July 4th, 1928. (314,902.)

20,827. "Vibration-responsive apparatus or microphones." H. E. Holman and H. A. M. Clark. July 6th, 1929. (332,723.)

21,081. "High-frequency generator circuit." Wired Radio, Inc. July 31st, 1928. (316,575.)

21,088. "Transformer tap-changing systems." Associated Electrical Industries, Ltd. July 21st, 1928. (315,867.)

21,250. "Electric cable connectors or joints." T. K. Cordes. March 19th, 1930. (332,729.)

21,311. "Centring devices for moving-coil loud-speakers." P. G. A. H. Voigt. July 11th, 1929. (332,730.)

21,567. "Photo-electric cells." C. B. Ellis (Soc. des Usines Chimiques Rhône-Poulenc). July 12th, 1929. (332,733.)

22,445/6. "Variable electric resistances." British Thomson-Houston Co., Ltd. July 20th, 1928. (316,096/7.)

22,454. "Mercury-vapour lamps." Thermal Syndicate, Ltd. (Deutsch Englische Quarschmelze Ges.). July 22nd, 1929. (332,744.)

23,396. "Dynamo-electric machines." Electro Dynamic Construction Co., Ltd., and N. Pensabene-Perez. July 30th, 1929. (Addition to 281,089.) (332,749.)

24,540. "Reception and distribution of electrical signals." A. Warwick, J. A. A. Taylor, and H. C. Holmes. August 10th, 1929. (332,771.)

24,582. "Electrical liquid rheostats applicable to the automatic regulation of electrical quantities." A. G. S. Sandison. August 12th, 1929. (332,773.)

24,715. "Electric incandescent lamps." General Electric Co., Ltd. August 17th, 1928. (Addition to 297,833.) (317,483.)

25,157. "Electric heaters for rivets and other work pieces." British Insulated Cables, Ltd., and L. B. Wilson. August 17th, 1929. (332,780.)

25,283. "X-ray screens." Schering-Kahlbaum Akt. Ges. August 28th, 1928. (318,152.)

25,579. "Electrical operation and control of metal-cutting and like machine tools." Keller Mechanical Engineering Corporation. September 6th, 1928. (318,587.)

25,808. "Means for actuating electric switches on motor vehicles." Harris and Sheldon, Ltd., and R. G. Turner. August 24th, 1929. (332,787.)

26,045. "System of electric motor control." International General Electric Co., Inc. August 27th, 1928. (318,111.)

27,033. "Electric drives for carding engines." A. L. Mond (Maschinenfabrik Oerlikon). September 5th, 1929. (Convention date not granted.) (318,628.)

28,851. "Method of headlighting and an electric lamp for use in connection with the same." B. S. Fox. September 23rd, 1929. (332,458.)

29,078. "Electric hair driers." T. Patermann. September 25th, 1929. (332,461.)

29,188. "Telephone and telegraph cables." Siemens-Schuckertwerke Akt. Ges. October 5th, 1928. (332,819.)

29,757. "Electrical instruments." Cambridge Instrument Co., Ltd., C. C. Mason, and E. B. Moss. October 1st, 1929. (332,469.)

30,390. "Switches and automatic starters for electric motors." Felten and Guilleaume Carlswerk Akt. Ges. October 31st, 1928. (332,825.)

31,336. "Radio and similar high-frequency receivers." Telefunken Ges. für Drahtlose Telegraphie. October 15th, 1928. (332,834.)

31,501. "Containers for electric condensers." Telephon-Apparat-Fabrik E. Zwietusch & Co., Ges. November 10th, 1928. (332,478.)

32,225. "Spark plugs." A.C. Spark Plug Co. December 7th, 1928. (332,492.)

32,715. "Electric accumulators." H. Elsner. March 26th, 1929. (Addition to 307,927.) (332,841.)

33,413. "Drying kilns." International General Electric Co., Inc. November 3rd, 1928. (332,491.)

33,827. "Electric circuit breakers." Associated Electrical Industries, Ltd. November 6th, 1928. (332,851.)

33,832. "Protective devices for electric machines working under a liquid." Siemens-Schuckertwerke Akt. Ges. November 7th, 1928. (332,852.)

34,003. "Electric time switches." G. B. Barker. November 7th, 1929. (332,855.)

34,558. "Switch control means for vehicle lamps." R. Bosch Akt. Ges. November 12th, 1928. (332,856.)

35,088. "Manufacture of electric cables." Siemens-Schuckertwerke Akt. Ges. November 17th, 1928. (332,861.)

35,674. "Electrical switchgear." Associated Electrical Industries, Ltd. November 23rd, 1928. (332,499.)

37,229. "Manufacture of electric incandescent lamps or the like apparatus with sealed glass envelopes." General Electric Co., Ltd. July 1st, 1929. (332,506.)

37,316. "Instruments for indicating the direction of a magnetic field." British Thomson-Houston Co., Ltd. December 6th, 1928. (332,507.)

39,137. "Electric accumulators." Pritchett & Gold & E.P.S. Co., Ltd., and H. M. Genese. December 21st, 1929. (332,875.)

39,795. "Electric starting motors." Scintilla Akt. Ges. January 14th, 1929. (332,878.)

39,864. "High-tension submarine electric cables." Felten & Guilleaume Carlswerk Akt. Ges. March 16th, 1929. (332,880.)

1930.

1,230. "Electric accumulators." Ø. Y. Imray. February 5th, 1929. (Addition to 325,581.) (332,884.)

4,507 "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., F. Kessler, H. S. Deves, and J. Scowcroft. April 19th, 1929. (Divided application on 12,216/29.) (332,561.)

5,147. "Television apparatus." Westinghouse Electric and Manufacturing Co. February 15th, 1929. (332,886.)

14,018. "Thermionic tubes." K. W. Daumann. April 20th, 1929. (Divided application on 331,250.) (332,562.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 13th:—

Dustette. No. 514,485. Class 6. Suction cleaning machines and parts thereof.—Hoover, Ltd., 239, Regent Street, W.1.

Gyrotone. No. 510,877. Class 8. Sound-reproducing apparatus.—John Wynn, The New Cinema, Coleshill, Warwickshire.

Illini. No. 513,411. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—British Sangamo Co., Ltd., Cambridge Arterial Road, Enfield, Middlesex.

Macobond, No. 513,560, and Macomet. No. 513,562. Class 8. Electric cables.—The Macintosh Cable Co., Ltd., 32, Osnaburgh Street, N.W.1.

Evol. No. 514,188. Class 8. Instruments for detecting leakage of electrical current.—E. L. Lee, 25, Victoria Street, S.W.1.

Nura (lettering and design). No. 511,784. Class 13. Electric lamps (ordinary).—Omega Lampworks Co., Ltd., Rodney Place, Merton Abbey, S.W.19.

Liver. No. 510,774. All goods in Class 17.—Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Lancs.

Bulwark. No. 507,367. Class 50. Electric fuse handles and bases made of condensation products of phenol and formaldehyde and the like electrical insulating substances.—C. W. Cox, 15, Hargreaves Road, Sefton Park, Liverpool.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABINGDON.—Houses (54), Caldecott Road; borough engineer.

ALTRINCHAM.—Post Office for H.M. Office of Works, King Charles Street, London, S.W.

BAKEWELL.—Houses (36) for the U.D.C.; surveyor.

BARNSTAPLE.—Cinema, Boutport Street, for Savoy (Barnstaple), Ltd.; W. H. Watkins, architect, Bristol.

BELPER.—Houses (80) for the R.D.C.; surveyor.

BILLINGHAM.—Libraries for the U.D.C.; surveyor. Bridge over level crossing (£54,000); Railway Co. and Durham county surveyor.

BIRMINGHAM.—Shops, Yardley Wood Road and Brook Lane; J. A. Perry & Wilson, architects, 147, Corporation Street.

BLACKBURN.—Houses (224) and shops (8) for the T.C.; Leyland Construction Co., builders.

BREDBURY.—Telephone exchange, Stockport Road; H.M. Office of Works.

BRENTWOOD.—Houses (100) for the U.D.C.; A. Clarke, architect, Ongar Road.

CONGLETON.—School for the borough E.C.; Bernard Widdowes, architect, Derby.

COVENTRY.—Cinema (1,600 seats) for Provincial Cinematograph Theatres, Ltd.; McLaughlin & Harvey, Ltd., 24, Highbury Grove, London, N.

COXHEATH.—Nurses' home, Infirmary (£14,000); Kent C.C.

DARWEN.—Senior school (£22,000) for the borough E.C.; director of education.

DENNY.—Municipal buildings, Glasgow Road; burgh surveyor.

DERBY.—Civic centre (£500,000); borough engineer. Houses (300), Chaddesden; Browning Bros., Leicester.

DURHAM.—Extensions, mental institution (£30,000); county architect.

EAST ASHFORD.—Conversion of premises to mental hospital (£12,000); Kent C.C.

ESSEX.—Central school, Brentwood, for Essex E.C.; director of education, Chelmsford.

FALMOUTH.—Houses (64), Penwerris estate; borough engineer.

GLASGOW.—Houses (1,400), Croft Wood estate; Western Heritable Investment Co., Ltd.

GRIMSBY.—Telephone exchange, Scartho Road; H.M. Office of Works.

HAYES (Middlesex).—Houses (90), Hyde Road; Unit Construction Co.

HIGH WYCOMBE.—Houses (325), with shops and flats, Kingscote, for the High Wycombe & District Housing Society, Ltd.; G. R. Gilbertson Topham, architect, 7, Victoria Street, London, S.W.

HOLYWOOD.—New block, county sanatorium (£10,000); Durham county architect.

IRISH FREE STATE (Cork).—Houses (155), Turner's Cross housing site, for city manager; Chillingworth & Levie, architects, 11, South Mall.

(Dublin).—Houses (42), Clontarf, for Dublin Public Utility Society; McDaniel Dixon & Downs, 20, Ely Place.

ISLE OF ELY.—Elementary school, Parsons Drove, for the Isle of Ely E.C.

KENT.—Central school, Higham, and junior and infants' school, Sheerness, for the county E.C.

LEEDS.—Offices, South Parade, for Legal & General Assurance Society, Ltd.; Braithwaite & Jackman, architects, 6, South Parade.

LONDON (Clerkenwell, E.C.).—Shops and factory buildings, Exmouth Street and Pine Street; Wills & Kaula, architects.

(Westminster, S.W.).—Bank, Grosvenor Gardens, for Westminster Bank, Ltd.; Frederick Etchells, architect.

(W.C.).—Shell-Mex offices, Hotel Cecil site; Messrs. Josephs, architects, Backhouse Lane, E.C.

LOWESTOFT.—Senior girls' school (640 places), for the borough E.C.; S. W. Mobbs, architect, Town Hall.

MANCHESTER.—Reconstruction of *Daily Mail* buildings, Deansgate, for Associated Newspapers, Ltd.; Robert Carlyle & Co., Ltd., builders, Elsinore Road, Old Trafford. Shops and offices for Noves estates, Oxford Street and Hulme Street; Pendleton & Dickinson, architects.

MARPLE (Ches.).—Cinema (800 seats) for T. Stott; W. Thornley, architect, 46, Wallgate, Wigan.

MONMOUTHSHIRE.—Schools, Penmaen and Wyllie, for the E.C.; director of education, Newport.

MORPETH.—Mental colony (£170,000); Northumberland C.C.

NESTON & PARKGATE.—Underground pumping stations and extension of sewage disposal works, Neston; H. B. Ward, engineer, 26, North John Street, Liverpool.

NOTTS.—Schools (500 places), Chilwell Road, Beeston, and Lenton Abbey (£43,000); for county E.C.

PEMBURY.—Extensions, Poor Law Institution (£40,800), for Kent Public Assistance Committee; clerk, Maidstone.

REIGATE.—Houses (36), Redstone estate, Redhill, for the T.C.; F. T. Clayton, borough surveyor.

ROTHERHAM.—Estate development, Broom Valley; Hutchinson & Son. Offices, shops, &c., Electric Picture House site; H. Garnett & Co., Ltd.

ST. ANDREWS (N.B.).—Houses (84); Walker & Pride, architects.

SALFORD.—Library, Liverpool Street and Langworthy Road, Seedley (£26,000); city engineer.

SLOUGH.—Hotel, Farnham Road, for Charrington & Co., brewers, London.

SMALLBURGH.—Houses (36) for the R.D.C.; surveyor.

SOUTHPORT.—Technical and art school (£50,000), for the E.C.

STOKE-ON-TRENT.—Eight schools for the city E.C.; director of education.

SUNDERLAND.—Houses, Tunstall (38), and Ryhole (30); R.D.C. surveyor.

SURREY.—Schools, Chipstead Valley (£12,780), West Ewell, and Mitchley Wood estate, Sanderstead; and extensions Kingston Technical Institute (£12,500); county architect.

THURNSCOE.—Town hall (£15,780) for the U.D.C.; surveyor.

TUNBRIDGE WELLS.—General hospital (180 beds), (£18,000); the governers of the Eye and Ear Hospitals

TYNEMOUTH.—Town hall; borough surveyor.

WARWICKSHIRE.—Secondary schools, Sutton Coldfield (£36,218), Binley (£10,700), and Rugby (£43,390), for the E.C.; also county offices, Warwick (£56,250) for the C.C.; A. C. Bunch, county architect.

WASHINGTON (Co. Durham).—Houses (60) for the U.D.C.; surveyor.

WEST HARTLEPOOL.—Infectious diseases hospital; borough engineer.

WIDNES.—Houses (212), for the T.C.; borough surveyor.

WINCHESTER.—Houses (140); city engineer.

WOLVERHAMPTON.—School (£29,844) for the borough E.C.; A. M. Griffiths & Son, Ltd., builders.

WORCESTERSHIRE.—Senior schools, Stourbridge Road, Halesowen (800 places), and Stourport (400 places), for the county E.C.